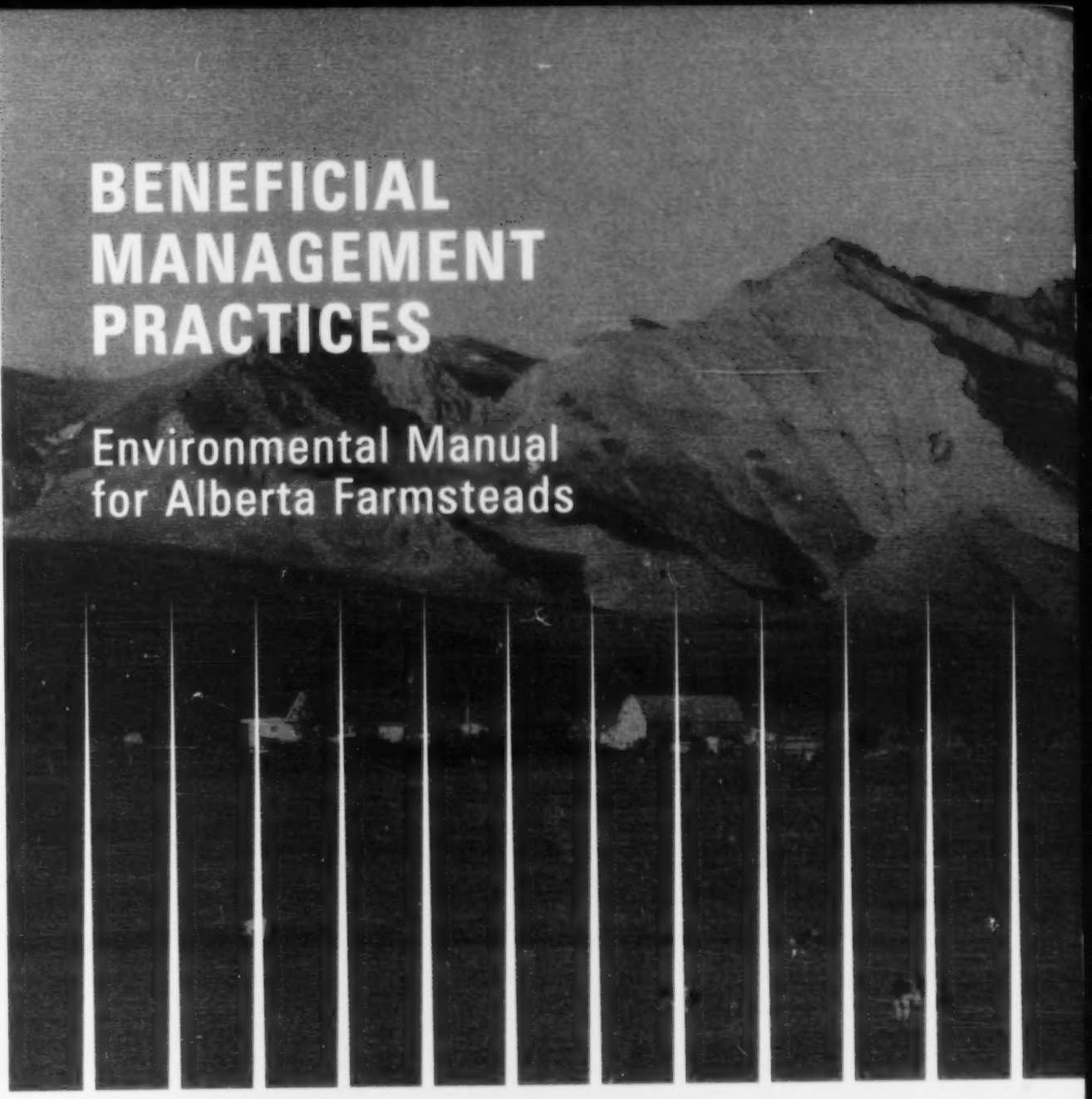
BENEFICIAL MANAGEMENT PRACTICES

Environmental Manual for Alberta Farmsteads



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Environmental Manual for Alberta Farmsteads

Agriculture and Agri-Food Canada
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Prairie Farm Rehabilitation Administration
Administration du rétablissement agricole des Prairies

Alberta

Beneficial Management Practices: Environmental Manual for Alberta Farmsteads

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This manual was prepared for Alberta's rural community to create a greater understanding of environmental risks associated with farmsteads and to assist individuals in implementing beneficial management practices to reduce those risks. It was written using the best available information from industry, government and interested stakeholders.

While the authors have made every effort to ensure the manual is accurate and complete, it should not be considered the final word on areas of law and practices covered. Individuals should seek the advice of appropriate professionals and experts as each situation may differ from those set out in the manual.

The guidelines are intended to provide management options for farmstead and acreage owners of various sizes and types. Individuals should not extract portions of this publication, nor draw inference, without considering all aspects of the farmstead and operation. Any level of government should not adopt these guidelines literally into legislation in whole or in part.

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Table of Contents

1.0 Introduction 1

1.1 Purpose 2
1.2 Background 2

2.0 Environmental Considerations 3

2.1 What is an environmental risk? 4

2.2 Environmental Hazards 5

2.2.1 Nutrients 6
2.2.2 Pathogens 7
2.2.3 Hydrocarbons 8
2.2.4 Salts 9
2.2.5 Pesticides 9
2.2.6 Odours 10
2.2.7 Dust and Smoke 11
2.2.8 Other Chemicals 12

2.3 Environmental Pathways and Receptors 12

2.3.1 Water 13
2.3.2 Soil 14
2.3.3 Air 15
2.3.4 Humans and Livestock 15

2.4 Taking the Next Steps 16
2.5 For More Information 17

3.0 Farmstead Water Sources 19

3.1 Water Wells 20

3.1.1 Water Volume 20
3.1.2 Well Location 21
3.1.3 Well Construction 22
3.1.4 Well Pits 23
3.1.5 Flowing Wells 24
3.1.6 Old and Abandoned Wells 24

3.2 Dugouts 25

3.2.1 Management of Inflow Water into Dugouts 27

3.3 Natural Water Sources 27
3.4 Pipelines 28
3.5 Legislation 28
3.6 For More Information 29

4.0 Pesticide Storage, Handling and Application 31

4.1 Pesticide Storage 32
4.1.1 Storage Facilities 32
4.2 Large and Small Scale Pestcide Handling and Application 33
4.2.1 Mixing and Loading Locations 34
4.3 Cleaning and Maintaining Application Equipment 34
4.4 Transporting Pesticides 35
4.5 Custom Applicators 35
4.6 Pesticide Training 35
4.7 Legislation 36
4.8 For More Information 37

5.0 Fertilizer Storage, Handling and Application 39

5.1 Dry Fertilizer Storage 40
5.2 Liquid Fertilizer Storage 40
5.3 Fertilizer Mixing and Loading 41
5.4 Anhydrous Ammonia 41
5.5 Application of Fertilizers 42
5.6 Legislation 42
5.7 For More Information 43

6.0 Fuel Storage and Handling 45

6.1 Siting and Setup 46
6.1.1 Minimum Separation Distances 46
6.1.2 Stands 47
6.1.3 Secondary Containment 48
6.1.4 Evaporation 48
6.2 Dispensing Fuel 49
6.3 Fuel Tank Safety 49
6.4 Small Containers 50
6.5 Monitoring for Fuel Losses 50
6.6 Transportation of Fuel 52
6.7 Legislation 53
6.8 For More Information 53

7.0 Surface Water 55

7.1 Surface Water Pathways 56
7.1.1 Water Pathway Characteristics 56

7.2 Managing Water Pathways 57
7.2.1 Manure Storage and Composting Operations 58
7.2.2 Animal Facilities 58
7.2.3 Disposal Sites for Mortalities 60
7.2.4 Silage Storage 60
7.2.5 Disposal Field Systems 60
7.3 Legislation 61
7.4 For More Information 61

8.0 Farmstead Waste Management 63

8.1 Burning 67
8.2 Household Hazardous Waste 68
8.3 Medical Wastes 68
8.4 Animal Health Care Products 69
8.4.1 Disposing of Veterinary Wastes 69
8.5 Livestock, Poultry and Farm Animal Mortalities 70
8.5.1 Burial 70
8.5.2 Incineration 71
8.5.3 Composting 71
8.5.4 Rendering 72
8.5.5 Natural Disposal 72
8.6 Pesticides 73
8.6.1 Proper Pesticide Disposal 73
8.6.2 Pesticide Container Disposal 73
8.7 Treated Seed 74
8.8 Using Oil for Road Surfaces 74
8.9 Legislation 75
8.10 For More Information 75

9.0 Household Wastewater Management 77

9.1 Proper Design and Siting of a Private Sewage Treatment System 78
9.2 Types of On-site Private Sewage Systems 78
9.3 Wastewaters and Associated Concerns 83
9.4 Maintaining On-Farm Sewage Systems 84
9.4.1 Septic Tank Maintenance 84
9.4.2 Greywater Options 85
9.5 Legislation 85
9.6 For More Information 86

10.0 Energy Efficiency 87

10.1 On-Farm Energy Audit 88
10.2 Field Operations - Tractors and Equipment 88
10.3 Lighting 89
10.4 Homes and Buildings 92
10.5 Shelterbelts 92
10.6 Alternative Energy Sources 93
10.7 For More Information 94

11.0 Nuisance 97

11.1 Dust and Smoke 98
11.2 Odour 99
11.3 Noise 100
11.4 Preventing, Managing and Resolving Conflict 101
11.5 Role of the Farmer's Advocate 102
11.6 Legislation 103
11.7 For More Information 103

12.0 Legislation 105

12.1 Federal Legislation 106
12.1.1 Fisheries Act 106
12.1.2 Pest Control Products Act 108
12.1.3 Transportation of Dangerous Goods Act 108
12.2 Provincial Legislation 108
12.2.1 Water Act 108
12.2.2 Environmental Protection and Enhancement Act 109
12.2.3 Livestock Diseases Act 112
12.2.4 Safety Codes Act 112
12.2.5 Agricultural Operation Practices Act 113
12.2.6 Soil Conservation Act 114
12.2.7 Weed Control Act 115
12.2.8 Agricultural Pests Act 115
12.3 For More Information 116

Appendix 117

Emergency Measures 117

Glossary of Terms 121

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CHAPTER 1.0

Introduction

1.1 Purpose

A beneficial management practice (BMP) is defined as any management practice that reduces or eliminates an environmental risk.

This manual has been designed to provide you, an Alberta producer, with information about beneficial management practices (BMPs) that deal with environmental risks on rural farmstead sites. BMPs maintain or improve a farm's soil, water, air and wildlife habitat resources, and therefore contribute to the farmstead's overall sustainability and to the economic and environmental health of the farm family, as well as the surrounding landscape and community. Since the farmstead is the heart of your operation, it is important to learn how to identify areas of potential risk. This manual offers you options for managing those areas of risk so that your farmstead remains the key to the health of your family, your livestock and the environment.

Each farm is unique. Not all beneficial management practices provided in the manual are suited to every situation or farmstead site. You will need to consider your site's specific environmental risks, and review the various options available to address those risks. Then you can choose those options best suited to your needs, and adapt them to the specific conditions on your farm.

More information on beneficial management practices to address environmental risks associated with crop and livestock production can be found for specific commodity groups. A series of Beneficial Management Practices manuals for Alberta producers are listed at the end of Chapter 2.

1.2 Background

Agricultural producers in Alberta value the environment and feel strongly about their role as stewards of the land. They also understand that for their farm to remain productive and for Alberta's agricultural industry to be competitive in world markets, they need to safeguard environmental quality.

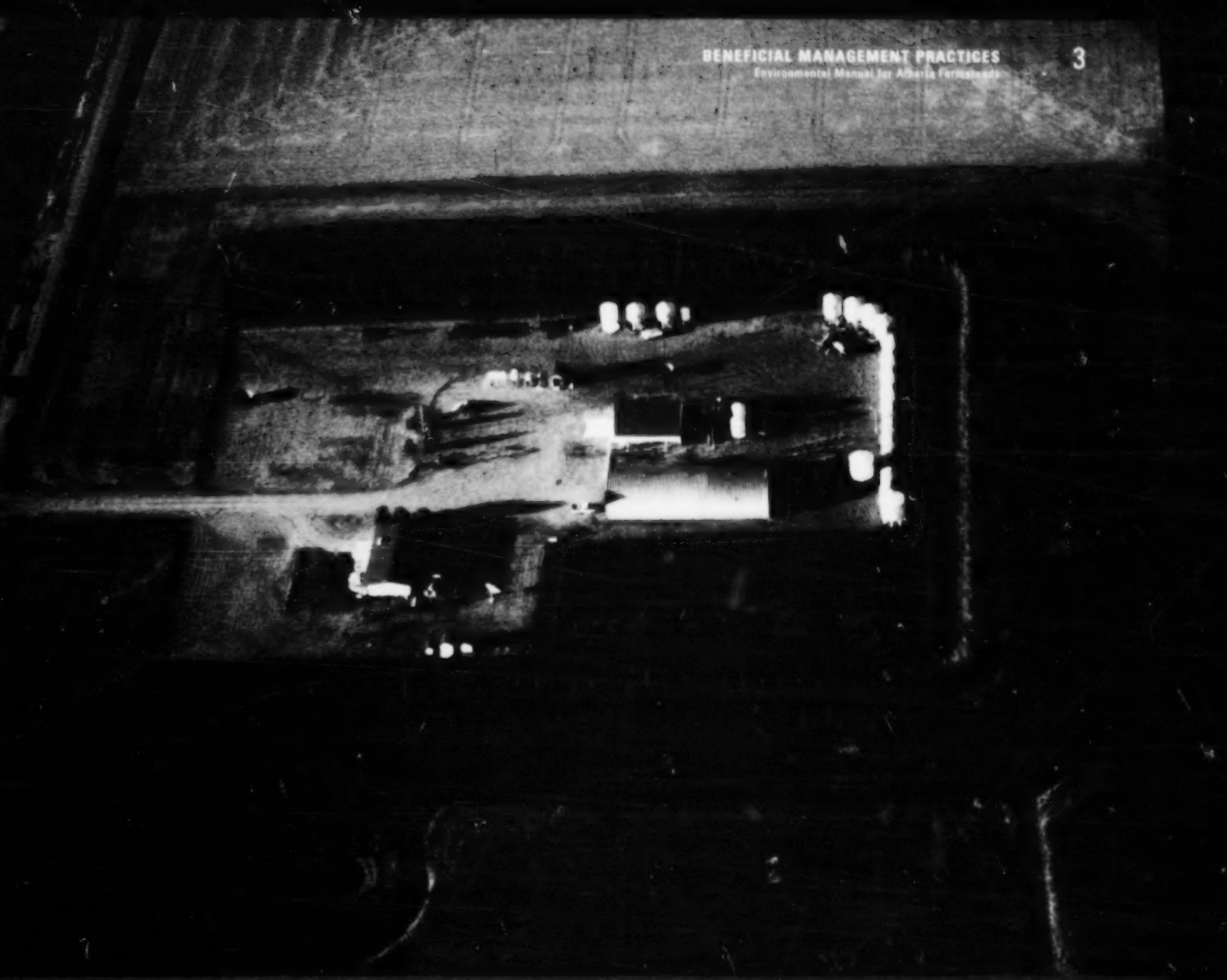
The competition for land and water resources has increased in recent decades as Alberta's population and economy have grown. This trend makes it increasingly important for everyone, including farmers, to manage these resources wisely.

Analyzing the location of any farmstead is a critical first step in improving the health of the operation's environment. By understanding how the farmstead fits into the landscape, producers can identify potential contaminants, foresee possible pathways for those contaminates to travel and predict where those contaminants might end up.

Understanding the farmstead's layout will ultimately assist in making appropriate management decisions. While some physical properties of a site, such as slope, soil type, water table and climate may be beyond a producer's control, management decisions can be influenced by these physical properties. Factors that can be managed include water supply, storage locations of potential contaminants and run-on and runoff control of surface waters. An emergency plan can also be developed to manage risk.

Managing risk and adopting BMPs suited to your farmstead are important in building and maintaining an operation that is economically sound as well as socially and environmentally responsible.

A glossary of terms is listed at the end of the manual; words defined in the glossary are highlighted in bold when they first appear in the main text.



CHAPTER 2.0

Environmental Considerations

This chapter discusses environmental risks on a farmstead in more detail and introduces the steps to assessing those risks.

Environmental risks may occur anywhere on a farmstead where water supplies are located and potential contaminants exist. A producer needs to consider the entire farmstead, when identifying any potential environmental risk. Humans and animals may be at a greater risk on farmsteads, due to their proximity to hazards stored and used on the farm.

2.1 What is an Environmental Risk?

Identifying environmental risk can become a complicated procedure, and many factors need to be considered. Since each farmstead is unique, the risks that exist on your operation need to be identified and evaluated.

Beneficial Management Practices (BMPs) are actions that can be taken to address a potential risk and minimize or eliminate its effects.

Three factors must exist for an environmental risk to be present:

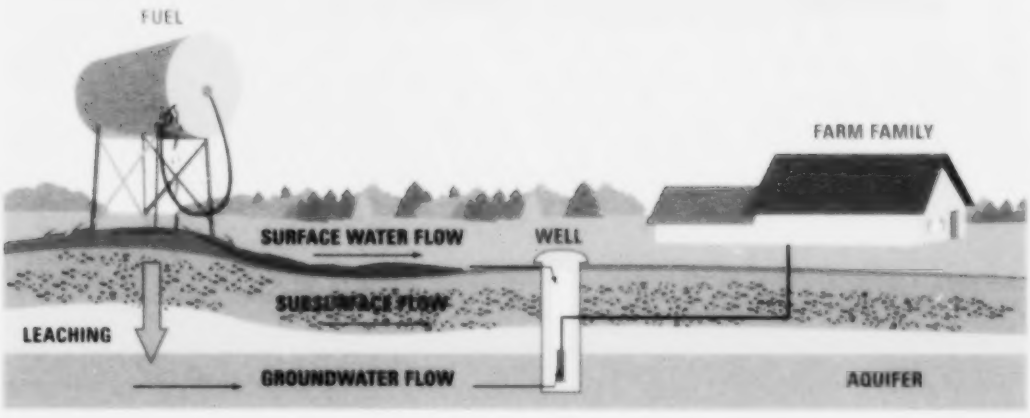
1. There must be a **hazard** or contaminant present.
2. There needs to be a **receptor** of the hazard.
3. There must be a **pathway** that has the capacity to carry the hazard to the receptor.

A hazard is defined as any source of **contamination** that has the potential to negatively affect a receptor. A receptor is something that has the potential to be affected by a given hazard, usually in an adverse way. The pathway is the method by which a hazard travels from a source to a receptor. Pathways can include water, air, soil, humans, animals or any combination of these.

By using a hypothetical situation, in this case a fuel leak from a storage tank, we can define risks by identifying these three factors.

> A fuel tank has a leak that goes unnoticed for a day. The fuel from the leak has moved through the gravel pad underneath the tank and into the soil. The following day, there is a major summer rainfall and the soil becomes saturated. Due to the topography of the site, water begins to flow overland and through the soil profile, towards the water well. The well is located downslope from the fuel tank, and the natural flow draws the water towards and down the side of the **well casing** into the **aquifer**. This is the well that is used by the farm family for drinking.

FIGURE 2.1 ENVIRONMENT RISKS ASSOCIATED WITH FUEL STORAGE LEAKS



The hazard is the fuel, while the following pathways include:

- soil containing the spill
- rainwater flowing over the ground and through the soil profile into the well
- **groundwater** entering the aquifer

The ultimate receptor is the farm family who drinks the water. Other receptors include:

- soil and grass – fuel-contaminated water flowing over the ground may have sterilization effects on soil and soil microbes.
- aquifer – fuel-contaminated water leaches through the soil affecting aquifer water supplies that may be used by other neighbours or farm animals.

All environmental risks need to be identified based on site-specific characteristics and you need to identify receptors and pathways based on the potential chain of events.

The rest of this chapter outlines more specific hazards and provides information on potential pathways and receptors that may exist on your operation. By reading the remainder of this chapter you will be better equipped to identify potential risks on your operation.

2.2 Environmental Hazards

Many different hazards exist on a farmstead, and when managed properly, they pose little or no threat to the environment and your family's health. Outlined in the table below (Table 2.1) are some examples of potential hazards and their possible sources that may exist within a farmstead.

TABLE 2.1 **POSSIBLE SOURCES OF HAZARDS ON A FARMSTEAD**

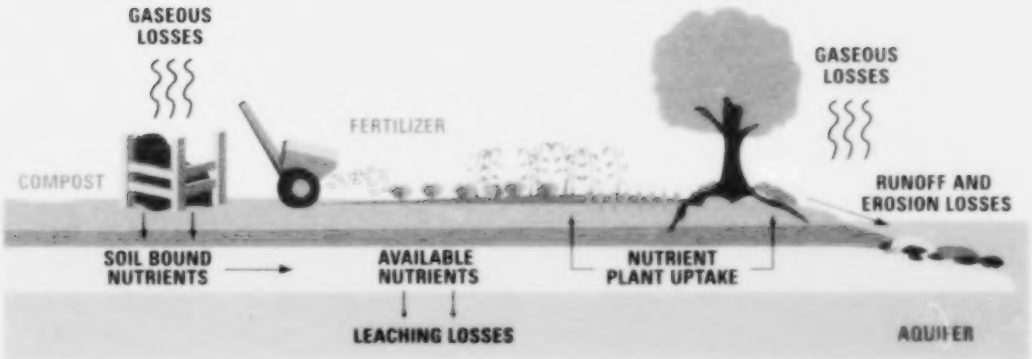
HAZARDS	SOURCES
Nutrients	Soil, inorganic fertilizer, manure, silage, household wastewater, compost materials, bales (organic residues)
Pathogens	Household wastewaters, manure, livestock mortalities, animal health care products
Hydrocarbons	Gasoline, diesel, kerosene, lubricants, oil
Salt	Feed, supplements, manure, inorganic fertilizer, hydrocarbons, pesticides, household wastewater, groundwater
Pesticides	Agricultural, household, garden
Noise	Loud machinery and equipment
Odour	Manure, inorganic fertilizers, silage, livestock mortalities, decomposing plant and animal residues
Dust and Smoke	Vehicle and machinery traffic, burning residues or wastes
Other Chemicals	Pharmaceuticals, cleaning solutions, aerosols, paints, solvents, stains, automotive fluids, refrigerant and air conditioning freons, farm wastes

2.2.1 Nutrients

Nutrients are essential for plant growth, but excess nutrients beyond plant needs may potentially become hazards. Sources of nutrients include chemical fertilizers, animal manures, household wastewaters, silage, soil and composted materials. Two nutrients of primary concern are nitrogen (N) and phosphorus (P).

There are three ways nutrients can move and potentially contaminate receptors (see Figure 2.2). Nutrients can either dissolve in water, bind to soil particles or be released in a gaseous form to the atmosphere.

FIGURE 2.2 POSSIBLE NUTRIENTS LOST BY LEACHING, IN RUNOFF OR AS GASES



Nutrients dissolved in water can potentially enter **water bodies** as **runoff** during snow melt, rainfall or irrigation. Dissolved nutrients can also be carried downwards through the soil profile by **leaching**, potentially entering groundwater supplies.

Nutrients bound to soil particles are susceptible to water and wind erosion, potentially contaminating water bodies. Soils, which are not subjected to erosion or runoff, will help hold nutrients allowing them to be released over time.

Nitrogen (N) can be released into the atmosphere in gaseous forms such as nitrous oxide (N_2O) or nitrogen gas (N_2). Nitrous oxide (N_2O) is one of the major contributors to **greenhouse gases**. Nitrogen can also be lost to the atmosphere as ammonia (NH_3), creating odours. More discussion on greenhouse gases and odours can be found later in this chapter.

Too much nitrogen in water supplies, in the form of nitrates (NO_3), can harm livestock and humans. Drinking water with high nitrate levels may cause nitrate poisoning, which reduces the amount of oxygen absorbed by body tissues. In human babies, this condition is known as "blue baby" syndrome, causing the skin to turn a bluish colour, particularly around the eyes and mouth. Livestock show symptoms of nitrate poisoning by having problems standing up and staggering. With prolonged exposure, excessive nitrate levels can eventually be fatal.

Elevated nutrient levels, particularly with phosphorus (P), degrade **surface water** quality by promoting excessive growth of aquatic plants and algae. Algal blooms exhaust the supply of oxygen, during growth and decomposition. During decomposition, microorganisms breakdown organic material, removing dissolved oxygen from the water. This reduction of oxygen can result in the death of fish and other aquatic organisms. Some types of blue-green algae can also release toxins deadly to livestock and humans during decomposition. Algae can also block water intakes, reduce the appeal of water bodies for recreation and give an unpleasant taste and odour to drinking water.

Water erosion carries nutrients in the topsoil off-site, potentially contaminating nearby water bodies — *Courtesy of AAFRD*

2.2.2 Pathogens

Microorganisms such as bacteria, parasites, protozoa and viruses occur naturally in animals, humans, soil and water. Pathogens are disease-causing microorganisms that can infect other animals and humans resulting in severe or fatal illnesses. A few common pathogens associated with farmsteads are ***Escherichia coli*** (E. coli), *Salmonella* species, ***Cryptosporidium*** *parvum* ("crypto") and ***Giardia*** *lamblia* ("beaver fever").

Pathogens can travel to humans and livestock through air, soil and water pathways but their survivability is limited by environmental conditions once they are shed or excreted by their host. Some pathogens can survive freezing or low temperatures for extended periods of time, while other pathogens may survive for much shorter periods in warm temperatures.

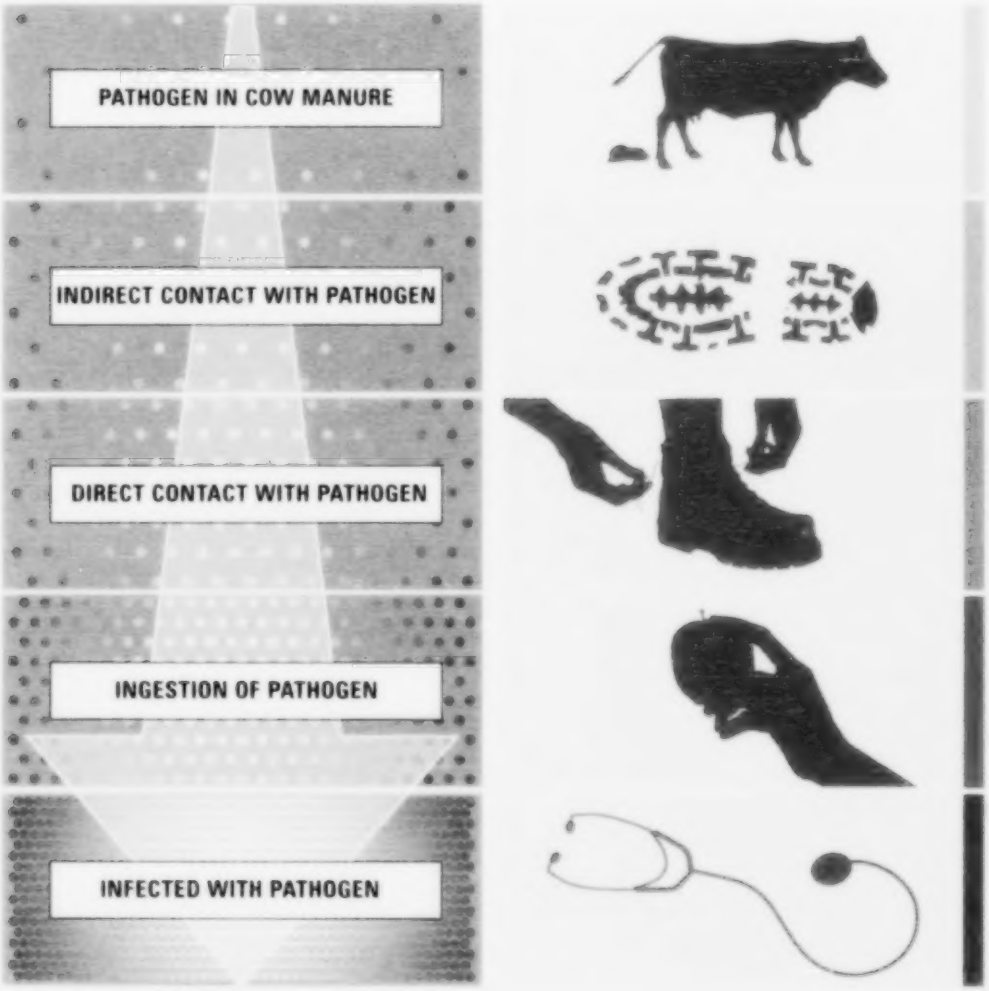
Water is an important transmitter of pathogens. People who drink contaminated water or eat contaminated food will more than likely become ill. Infection and illness may also occur in people using contaminated water for recreational purposes.

Pathogens can contaminate food sources either through direct surface contamination or indirect contamination from soil and water. In addition, raw or inadequately cooked food, in particular meat and eggs, and non-pasteurized fruit juices and dairy products can potentially infect people.

Pathogens can potentially transfer between animals and people through direct and indirect contact. Common pathways of transmission include contact with animals, animal manure, contaminated animal products, feed or equipment (see Figure 2.3). Activities that potentially increase the risk of infection include working closely with livestock, treating sick animals, hunting or processing animal products for food. Person-to-person transmissions can occur as well, especially when infected people do not use proper hygiene such as washing hands before cooking or eating, or after using the washroom.

Through proper management practices, producers can minimize their risk of pathogen infection and the introduction of pathogens to the food chain and the environment. Using proper personal hygiene, food handling, processing and cooking procedures can prevent transmission. Good animal care, sanitary livestock facilities and sound manure management practices will also significantly reduce or completely stop the transmission of pathogens from animals to people.

FIGURE 2.3 AN EXAMPLE SHOWING PATHOGEN TRANSFER FROM CATTLE TO PEOPLE



2.2.3 Hydrocarbons

Hydrocarbons are currently the world's main source of heat and power. Fuels and lubricants contain hydrocarbons that can be hazardous to the environment. Human health risks are also associated with these products, but this manual focuses on environmental risks. Additional information on health risks can be found in Material Safety Data Sheets (MSDS) available from your fuel delivery company.

Products containing hydrocarbons such as gasoline, diesel and kerosene can be explosive and very volatile. The build up of vapours in an area can be toxic to humans or livestock. Thus when working with fuels, work in a well-ventilated area, and follow all safety precautions such as wearing goggles, gloves, coveralls and masks.

Fuels can potentially contaminate water bodies and **water sources** by moving quickly over and through the soil. Fuel can flow over the soil surface with runoff into surface water bodies or migrate downwards through the soil into groundwater supplies. It only takes a few litres of gasoline to severely pollute a farmstead's drinking water. The water may smell and taste fine, but may still be contaminated even though the amount of contaminant is small. Most soil and water contamination occurs when there is a fuel spill or a leak.

2.2.4 Salts

Salts occur naturally in the soil and are also found in hydrocarbons, inorganic fertilizers, feed, supplements, manure, some pesticides and household wastewater.

Salts in a saline seep where salty groundwater discharges and salts that are applied to land in excess alter the soil structure and reduce a soil's capacity to hold water. In the case of septic fields, high salinity in the soil decreases the field's ability to treat the wastewater and ultimately shortens the life of the system. The salts will also alter soil pH and limit the growth of certain types of vegetation. Remediation of saline areas is possible, but the cost is high and results are not observed for a long time.

Saline seeps form where saline groundwater comes to the soil surface — *Courtesy of AAFRD*

2.2.5 Pesticides

Pesticides are designed to supress or kill target plants, fungal diseases, insects, animals and pathogens. Types of pesticides used in farmstead management include herbicides, fungicides, insecticides, rodenticides, pesticide-treated seed and topical parasiticides (pour-on or powders for treating parasites on livestock).

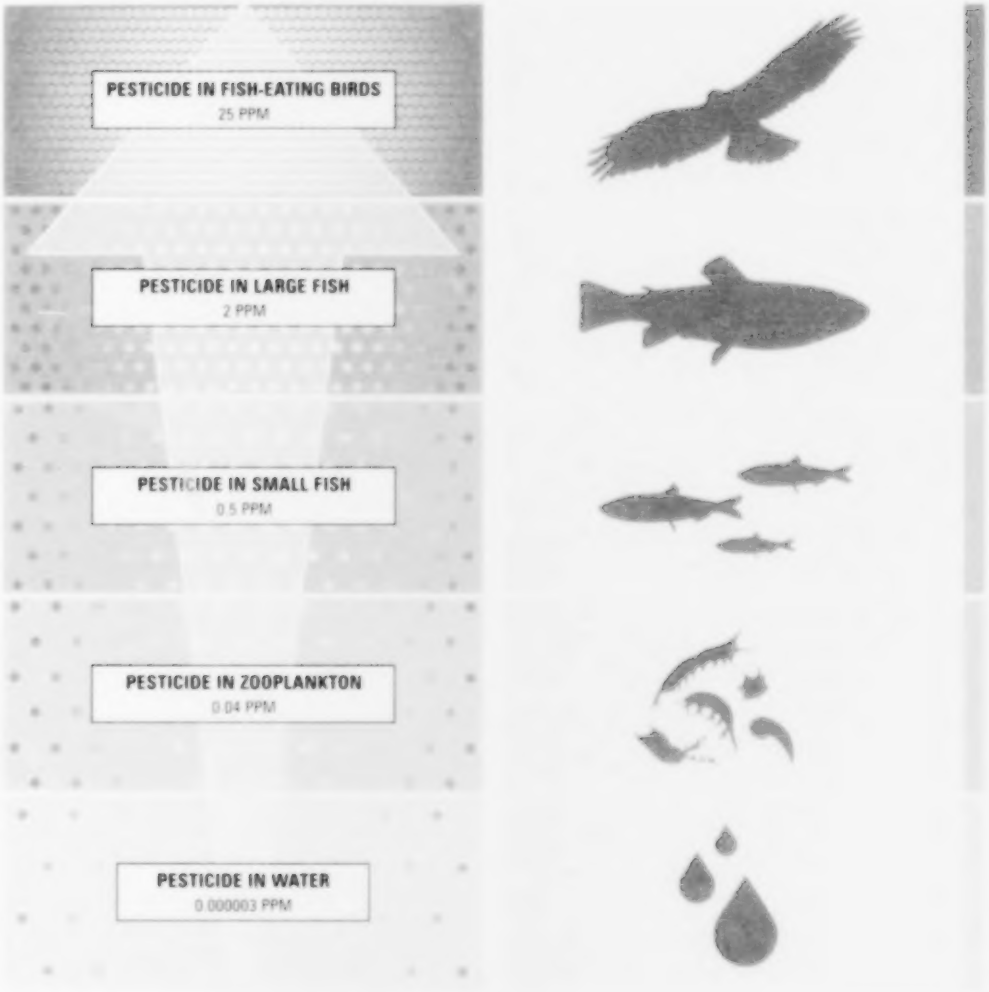
Pesticides can be a risk to non-target organisms if these products are not handled and applied properly. They can be carried great distances from target areas or application sites to non-target areas in several ways:

- dissolved in runoff water moving away from target areas
- attached to soil particles and carried by wind or runoff water
- spray drift onto water bodies and vegetation

Drift toward farmsteads and other residences can also damage gardens, trees and may create human health problems.

While some pesticides degrade quickly in the environment, others can persist over a significant time period, accumulating in the tissue of organisms through a process called **bioconcentration**. With every step in the food chain, larger quantities of the accumulated pesticide are consumed. This accumulation, called **biomagnification**, may continue to the point where animals are harmed or become unsafe for human consumption (see Figure 2.4).

FIGURE 2.4 BIOMAGNIFICATION



Although most pesticides currently used are not toxic to humans, there is the potential for acute or chronic problems if pesticide label directions are not followed. Proper storage and handling practices should be followed to reduce risks associated with pesticide use. Knowledge of the chemical, proper application practices and disposal are the bases for responsible pesticide use in and around the farm.

2.2.6 Odours

Sources of odours on the farm can include compost, manure, commercial fertilizers, silage, decomposing **organic matter**, livestock mortalities and household wastewaters. Odours differ depending on the source and the receiver's response to the smells themselves. Most of the odours from the above mentioned sources are a result of ammonia (NH_3) and hydrogen sulphide (H_2S) gas levels.

Odour is generally considered a **nuisance** rather than a health risk to neighbours because of the degree of dilution and dispersion that occurs within short distances from the odour source. Here the discussion includes human response to odour, which is unique for each person and extremely variable, and the environmental factors of the site, which can be managed to reduce the environmental risk to air quality.

It is difficult to evaluate odour and its effects for the following reasons:

- Odour from manure is made up of about 160 compounds. Humans have varied responses to these compounds.
- The proportion and characteristics of odour contributed by each of the primary sources (barns, storages and land application) are not well understood. Research is underway to characterize odours released from each of these sources.
- Odour intensity and offensiveness varies between individuals.
- The combination of different odours can have positive and negative effects on intensity and offensiveness. These effects are not easily predicted.

However, there are management practices that can control odour within reasonable limits. Odour mitigation practices should focus on reducing the nuisance to neighbours, by minimizing the frequency, intensity, duration and offensiveness of odours.

While research and development are underway to find solutions for odours, the following factors should be considered:

- To date, no technology emerges as a clear choice for the industry because of costs (real and perceived) associated with implementation and long term operation of the technology.
- The technology to completely prevent and remove odour either does not exist or is prohibitively expensive to install and/or manage.
- Many odour control technology studies have focused on **mitigation** of odour at a particular location of the operation or reducing emissions from a single source.
- Effective odour control strategy for a livestock operation may require using more than one technology or management practice.
- More research is needed to further evaluate the effectiveness of some of the odour control technologies that have been tested.

GREENHOUSE GASES AND AGRICULTURE PRODUCTION

Water vapour (H_2O), carbon dioxide (CO_2), methane (CH_4), ozone (O_3), nitrous oxide (N_2O) and halocarbons (used in refrigerants) are the main greenhouse gases in the atmosphere. The trapping of heat by these gases controls the earth's surface temperature. Emissions from human activities are important additional sources of greenhouse gases. Increasing concentrations of these gases are believed to increase global warming. Global warming may affect water quality and quantity and may result in problems such as more severe or extreme weather events like tornadoes, droughts, winter storms and more forest fires.

2.2.7 Dust and Smoke

Dust creates environmental problems and social concerns. It may contain nutrients, diseases, seeds, pollen and plant tissue, as well as agrochemicals, such as pesticides. These materials can cause health problems such as respiratory problems and, in the case of pesticides, contaminate non-target areas. As well, dust from road travel or farming activities such as tillage, harvest or manure hauling can reduce visibility on nearby roadways and may result in traffic accidents.

Smoke from burning brush or other farm wastes can create similar problems to dust. Burning wastes on the farm has been a common practice for years, but there are hazards associated with this practice. Depending on the type of waste, various by-products can be produced while burning that can cause respiratory concerns for animals and humans. As well, the ash left behind can be contaminated with heavy metals that should be disposed of properly. When burning wastes on the farm, it is important to sort them and consider other disposal alternatives. For more information on managing farm wastes, refer to Chapter 8 in this manual.

Dust generated from farming activities can increase environmental risks — *Courtesy of PFRA*

2.2.8 Other Chemicals

All chemicals found on the farm are potential hazards to the environment if not managed and disposed of properly. There are other farm chemicals besides pesticides that need to be managed with the same care and responsibility.

Some of these other chemicals include:

- animal and human pharmaceuticals (expired, banned and unused antibiotics, vaccines, etc.)
- cleaning solutions, stain removers, disinfectants, aerosols
- paints, stains, adhesives
- automotive fluids (antifreeze, transmission fluids, etc.)
- freon (from refrigerants and air conditioning units)

For further information on how to deal with hazardous chemicals, refer to Chapter 8.

2.3 Environmental Pathways and Receptors

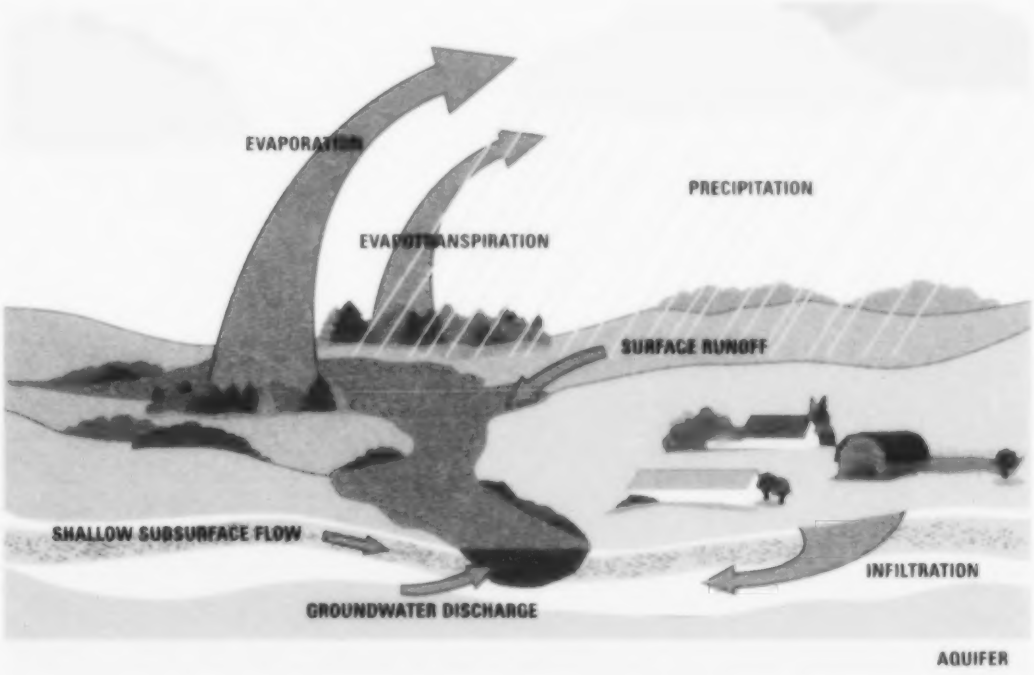
After reviewing farmstead environmental hazards, it is necessary to look at pathways and receptors as the final requirements to defining a risk. A receptor is something that has the potential to be affected, usually in an adverse way, by a given hazard. The pathway describes how that hazard travels from a source to a given receptor. Pathways can include water, air, soil, humans, animals or any combination of these. Remember that some pathways can also be considered receptors depending on the chain of events when a hazard is released.

Water, soil and air pathways can become quite complex and intertwined, making it easy to overlook a potential risk. The following sections provide more information to help you better identify the environmental risks and potential receptors on your farm.

2.3.1 Water

Within a farmstead, water can be found in various locations including permanent water bodies such as creeks, dugouts, ponds, lakes, sloughs and groundwater aquifers. Water bodies can also include intermittent water resulting from runoff created by snow melt and rainfall. Although these waters exist temporarily, they can serve as pathways that can transport hazards to receptors. The water cycle in Figure 2.5 demonstrates water movement and outlines how surface water and groundwater are interconnected.

FIGURE 2.5 WATER CYCLE



When water has a specific use, it can be considered a receptor and therefore becomes a concern. Specific uses include domestic or livestock consumption, irrigation, recreation and **habitat** for aquatic life. How a water source is evaluated will also depend on the connection between the surface water and groundwater at the site and the potential for water to move offsite. If water moves offsite, whether above or below ground, the concern is that you no longer have control of it and the hazard it may carry.

To effectively reduce environmental risks, the goal is to manage water pathways. This could include controlling the movement of water and providing an opportunity for the hazard to be treated before flowing into a significant water body if possible.

The following factors that affect water pathways should be considered when developing action plans to reduce risks:

- Most runoff comes from spring snow melt and presents a great risk to surface water, potentially contaminating it as the soil is still frozen and water **infiltration** is limited.
- Infiltration of water is slower in fine-textured soils (clay), increasing the amount of runoff from these soils into surface water.
- Infiltration of water is faster in coarse-textured soils (sand), increasing the amount of water that will infiltrate the soil and reach groundwater.
- Long and steep slopes will increase the speed at which water will travel, reducing water infiltration rates and capture of hazards.
- Packed soils and paved surfaces, as found in farmsteads, will reduce infiltration and increase surface water runoff.
- Permanent vegetation cover within the pathway will slow water down and can, in turn, capture hazards both dissolved and in soil particles. Depending on the hazard, this approach may be a form of treatment reducing the risk.

2.3.2 Soil

Soil is made up of four major components: organic matter, mineral particles, water and air. Soil can be considered a receptor when it contains hazards either dissolved in the water component, as vapours in the pore spaces or physically attached to soil particles. If the movement of soil through water and wind erosion provides a way for these hazards to move to other soils or into water, then the soil becomes a pathway.

Soil characteristics can determine the seriousness of risk that may occur. High organic matter soils will be less susceptible to erosion or movement by water and wind. These soils will hold more water and therefore more nutrients and other hazards. On the other hand, high organic matter soils will contain more microbes that may be able to treat or breakdown hazards.

Typically within a farmstead, many areas will have compacted soils. Roadways, equipment storage areas and building floors all have reduced permeability, increasing the surface movement of water and potential hazards. This movement may carry hazards into areas of your farmstead where surface water and groundwater are located or connected, increasing the risk to these water sources.

To effectively reduce environmental risk, the management options of soil pathways could include controlling the movement of the soil and maintaining healthy soils that will increase the chance for the hazard to be treated.

The following factors affect soil pathways and should be considered when developing action plans to reduce risks:

- Roadways and some equipment storage areas will not have the ability to absorb water and will increase runoff of water. The direction of the runoff water should be considered when looking at environmental risks. Due to poorer structure and less organic matter, these soils will be unable to treat some hazards.
- Soil covered by plants or plant residues is less susceptible to water erosion than bare soil. Growing plants and a crop residue cover absorb the energy of raindrops and slow the flow of runoff, reducing the risk of erosion. Roots hold soil in place and contribute organic matter, which further stabilizes the soil.

2.3.3 Air

Air can be another pathway through which a hazard may travel. Air pathways allow hazardous materials to move through the environment from a source to a point of contact with receptors. For instance, the release of hazardous materials can have an effect downwind.

Air pathways are governed by wind speed, wind direction, topography of the land and the climate of the area such as temperature and rainfall. The point of contact will change as quickly as the wind changes its direction and speed, so the effect of the air pathway may cover larger areas than those of soil or water pathways. Compared to other pathways, exposure by air pathways is generally hard to predict.

The form and chemical makeup of the hazardous materials influence how they are dispersed into the environment. Some hazards will evaporate when exposed to air; others can be suspended in the air as very small particles. They can become attached to dust or soil particles, or they can be dissolved in fine water droplets, both of which are then moved by wind.

To effectively reduce environmental risks associated with air pathways, consider controlling the movement of air and reducing the incidence of hazards in the air.

2.3.4 Humans and Livestock

Human and livestock activities can transfer hazards such as pathogens and diseases. The term **biosecurity** refers to precautions taken to reduce the risk of introducing livestock or poultry diseases to a farm or region where the disease does not already exist. Examples of common biosecurity practices include quarantining new stock, controlling rodents, providing animal and worker foot baths, cleaning equipment, cleaning footwear and changing coveralls.

Biosecurity is important because it can:

- Prevent the introduction of diseases from other countries, such as foot-and-mouth disease. These foreign diseases can spread quickly, resulting in the loss of export markets. They can also have severe economic consequences for the entire livestock industry.
- Prevent the spread of certain diseases already found in Alberta, such as transmissible gastroenteritis in pigs or Johne's disease in cattle. These diseases can have a significant financial effect on a farm operation, and visitors could potentially be held liable if proven to be the cause of an outbreak.
- Protect the operator and his or her family from diseases found in animals that are transmissible to humans, such as salmonella, E. coli 0157:H7 and campylobacter.
- Be an indicator of the operation's commitment to the health of the livestock and poultry industry, as well as to its visitors.

A biosecurity program should be practiced by anyone who owns or works with livestock, and visits farms, stockyards, abattoirs or premises where livestock or poultry products are handled, and attends auction markets and livestock shows.

A complete farm biosecurity program will cover the following:

- incoming stock
- vaccinations
- feedstuffs
- water
- pets
- pest control (birds, rodents, wildlife, insects, etc.)
- farm visitors

A biosecurity plan cannot meet the needs of all farms or agricultural businesses. The diseases and potential risks vary between livestock species and depend on the activities occurring on the premises. For example, a pig barn may have stricter requirements than a bison operation or a purebred breeder may have higher standards than a feedlot operator. Each business must assess their own potential risks and develop a flexible and practical biosecurity plan tailored to its circumstances.

BIODIVERSITY ON THE FARMSTEAD

Once you have identified and considered environmental risks on your farmstead, you need to take a step back and look at the entire farmstead. **Biodiversity** is one benefit of having a well-managed farm. The loss of biological diversity can decrease future land use opportunities and threaten sustainability as biodiversity is an important part of various **ecological processes**.

Biodiversity helps ensure that the environment can handle hazards. For instance, having a well-vegetated water pathway with a wide variety of plant and soil microbe species can act as a buffer to manage hazards that may exist. This also slows water down as it cycles in its natural system and allows the environment to filter out hazards as they pass through the system. If there are many plants of the same species, the chance that a species will survive if a hazard affects its growth is reduced. With a diverse number of species, there is a greater chance that at least one, or a combination of more will survive and be able to reduce risks due to the hazard.

2.4 Taking the Next Steps

The steps in assessing environmental risk include the following:

1. Identify all potential hazards, pathways, receptors and combinations of these on your operation.
2. Determine the likelihood that receptors would be at risk because of those hazards.
3. Assess the level of effect these risks have to determine their seriousness and what level of action is required.
4. Identify reasonable actions or beneficial management practices that are necessary to manage high-risk situations.

This Environmental Manual for Alberta Farmsteads will give you a start at dealing with environmental risks on your farm and provide you with some beneficial management practices or options to address them. Listed at the end of this chapter are other manuals that provide more information about managing risks on other aspects of farming operations.

In Alberta, a producer organization administers a program to help you identify and assess environmental risks on your operation. For more information on doing a self-assessment of environmental risks on your farm, contact the Alberta Environmental Farm Plan Company (AEFP Co.). Their contact information is in the For More Information section at the end of this chapter.

2.5 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697

- Ammonia Emissions and Safety Agdex 086-6
- Beneficial Management Practices: Environmental Manual for Alberta Cow/Calf Producers Manual 2004 Agdex 420/28-2
- Beneficial Management Practices: Environmental Manual for Crop Producers in Alberta 2004 Agdex 100/25-1
- Beneficial Management Practices: Environmental Manual for Dairy Producers in Alberta 2003 Agdex 410/28-1
- Beneficial Management Practices: Environmental Manual for Feedlot Producers in Alberta 2002 Agdex 420/28-1
- Beneficial Management Practices: Environmental Manual for Hog Producers in Alberta 2002 Agdex 440/28-1
- Beneficial Management Practices: Environmental Manual for Poultry Producers in Alberta 2003 Agdex 450/28-1
- Biosecurity Considerations for Ag Tourism Ventures Agdex 888-7
- Dryland Saline Seeps: Types and Causes Agdex 518-12
- Emergency Measures for Control of Wind Erosion Agdex 572-1
- Introduction to Water Erosion Control Agdex 572-3
- Introduction to Wind Erosion Control Agdex 572-2
- Manure and Pasture Management for Horse Owners Agdex 460/27-1
- Nitrate Poisoning and Feeding: Nitrate Feeds to Livestock Agdex 400/60-1
- Watercourse Improvement and Gully Restoration Agdex 573-5
- Water Quality Fact Sheets

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Environment

Publications: 780-427-2700

- Pesticides in Surface Waters – Facts at your Finger Tips Pub #1/10011

Information Centre: 780-427-2700
Website: www.gov.ab.ca/env

Agriculture and Agri-Food Canada

Publications: 613-759-6610

- Agriculture and Climate Change
- The Health of Our Air

Website: www.agr.gc.ca

Agriculture and Agri-Food Canada – Prairie Farm Rehabilitation Administration

Contact your regional office

- Water Quality Matters Fact Sheets

Website: www.agr.gc.ca/pfra

Pest Management Regulatory Agency

Publications: 1-800-267-6315
Website: www.pmra-arla.gc.ca

Alberta Environmental Farm Plan Company

Office: 1-866-844-2337
Website: www.albertaefp.com

Canadian Cattlemen's Association

Office: 403-275-8558

- Greenhouse Gas Sinks and Sources Tour Guide for Canadian Beef Producers

Website: www.cattle.ca

CHAPTER 3.0

Farmstead Water Sources

This chapter discusses beneficial management practices that address water sources on the farmstead.

Water supply is critical to any farm or farmstead. Both the quantity and quality of water are important, and every effort must be made to conserve supplies and prevent contamination.

Major water sources for farmsteads include water wells, dugouts, natural water sources and pipelines. Contamination of any water supply can occur in a variety of ways. However, with proper planning and management, any environmental or health safety risks can be eliminated or minimized.

3.1 Water Wells

One of the most important assets on your farmstead is the water well. Albertans typically choose water wells wherever there is an adequate supply of good quality groundwater.

When analyzing the quality and quantity of water from the well, gather as much information about all wells, used and unused, on the farmstead that you can, including the following:

- number of wells located on the farmstead
- well type
- purpose
- construction date(s)
- depth
- casing size
- well yield in gallons per minute
- supply or quality problems
- location of the well in proximity to potential environmental hazards

If you do not have copies of the original water well driller's reports, you can obtain them from the Groundwater Information Center. (For contact information, refer to For More Information at the end of this chapter.)

3.1.1 Water Volume

Aquifers are recharged by precipitation or infiltration from surface water bodies normally in the spring and early summer when precipitation exceeds evaporation and transpiration rates of plants. Shallow **water table** levels will naturally fluctuate seasonally (increasing in the spring and decreasing over the rest of the year) as the water is used by plants, discharged to springs or recharging deeper aquifers. Water levels in deeper aquifers will fluctuate less and only show changes after long periods of drought or water use. Water pumped out of wells will reduce the levels further. It is extremely important that the volume of water being pumped from the well does not exceed the recharge capacity of the aquifer supplying the well. This situation can potentially make the groundwater unavailable over time.

If groundwater withdrawal from an aquifer is faster than its recharge rate, then the groundwater is "mined" from the aquifer. Groundwater mining is often an unintentional process. As the old adage says "you don't miss the water until the well goes dry."

For most household situations, wells with a production rate of less than five gallons per minute (gpm) for a one-hour period (during peak use) do not supply enough water. It becomes necessary to create additional water storage using a tank or cistern. If the short term water requirements exceed the well pumping rate, it is often beneficial to use a cistern to accumulate water. This stored water can then be re-pumped into the distribution system to meet short term demands.

For example, a well capable of pumping only 1 gpm could only supply enough water for a few cows if it was pumped directly into a stock waterer. However, if that same well pumped into a cistern for storage for 15 hours per day and then pumped to a stock tank at 10 gpm, it could supply 60 cows.

CISTERNS

Adding a cistern to a farmstead can help supplement slow-producing wells that do not produce sufficient water to meet peak water demands. A cistern that will hold one half to one day's water storage can eliminate the need for another well or wells. The water can then be re-pumped at a much faster rate to meet the peak demands.

3.1.2 Well Location

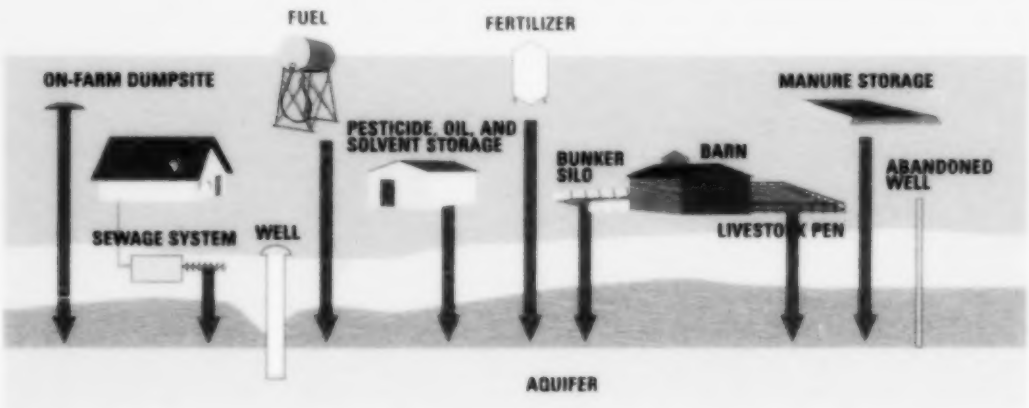
To avoid water quality problems, a well should be located on high ground that is not subject to flooding and upslope from any potential or known contaminant sources such as livestock c rals, manure storage, household sewage systems, etc. (see Figure 3.1). Setback distances, also known as **minimum distance separations** (MDS), are required legally or recommended for locating your well.

Minimum distance requirements in Alberta indicate the well must be at least:

- at a site where the well is accessible for servicing
- 3.25 m (11 ft) from a building
- 10 m (33 ft) from a watertight septic tank
- 15 m (49 ft) from a sub-surface weeping tile effluent disposal field or treatment mound
- 50 m (164 ft) from sewage effluent discharge to the ground
- 100 m (328 ft) from a sewage lagoon
- 50 m (164 ft) from above-ground fuel storage tanks
- 100 m (328 ft) from a manure storage facility or collection area or livestock yard
- 30 m (98 ft) from a manure application area
- 500 m (1,640 ft) from a sanitary landfill, modified sanitary landfill or dry waste site
- 100 m (328 ft) from any dead animal burial or composting site
- 30 m (98 ft) from any old existing leaching cesspool; the installation of a leaching cesspool is no longer permitted

(Note: equivalent imperial distances in feet are rounded up to nearest foot.)

FIGURE 3.1 POSSIBLE HAZARDS TO WATER WELL



3.1.3 Well Construction

A water system that is well planned and properly constructed will ensure that you and your family have a reliable and safe water supply. A poorly constructed or located well provides a direct path for contaminants to travel from the surface directly to the aquifer.

Multi-aquifer well completion allows water to mix from several aquifers, which may have significantly different water qualities (see Figure 3.2). Multi-aquifer completion can also allow water to drain from one aquifer into another, depleting some aquifers and potentially contaminating others. The driller must ensure that the water well is constructed in a manner that does not result in multi-aquifer completion.

Installing a proper well casing and formation seal effectively prevents contaminated surface water, or groundwater, from seeping along the outside of the casing and entering your well (see Figure 3.3).

FIGURE 3.2 MULTI-AQUIFER WELL COMPLETION

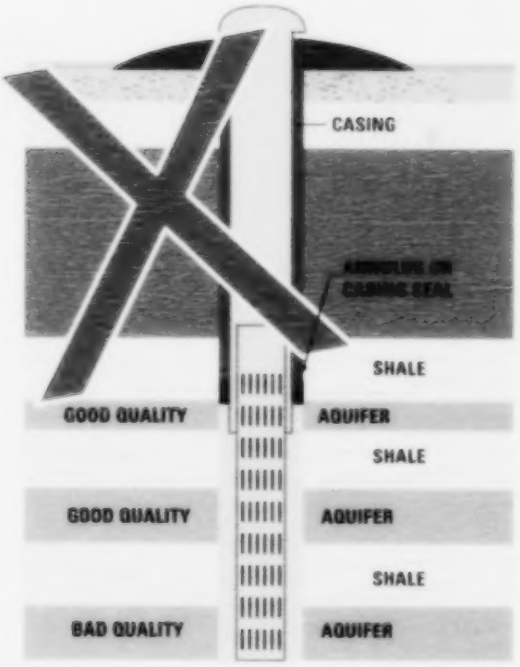
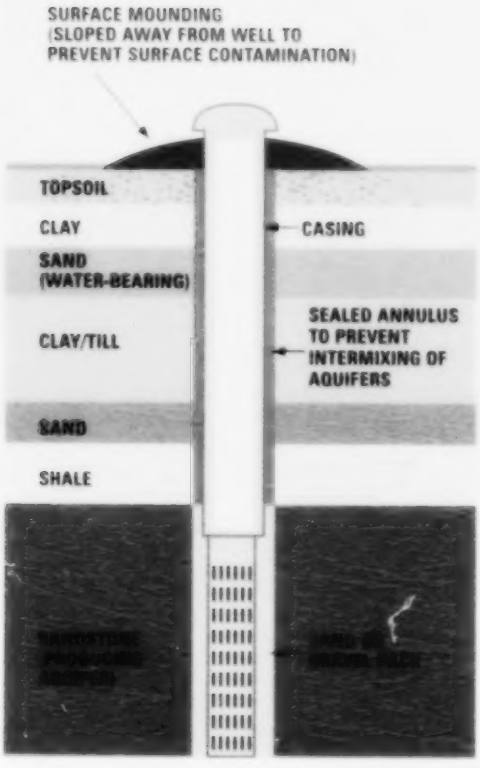


FIGURE 3.3 ANNULUS OR CASING SEAL



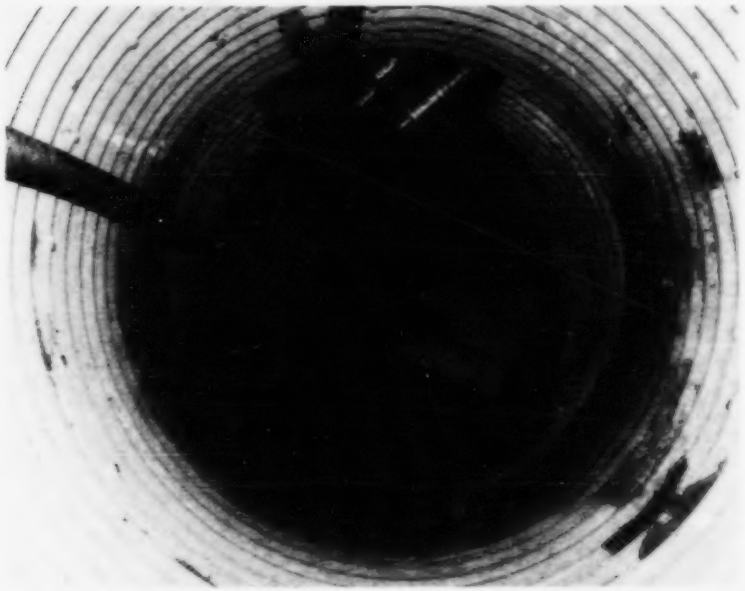
TESTING FOR WATER QUALITY

All farm water sources should be tested when the supply is connected initially and again about every 1 to 2 years. Test the water more often if you notice a significant change in the water quality, if a toxic spill occurs nearby or if a change occurs in land use or activity. A thorough chemical and microbiological analysis of water for household use can be done through your local health region. Water samples for agricultural purposes can be taken to private labs for testing. These labs will supply sample bottles and the correct procedures for sampling.

3.1.4 Well Pits

Provincial regulation now prohibits locating wells in pits. **Well pits** provide a place for contaminated surface water or shallow groundwater to collect, which can contaminate the aquifer by seeping around the outside of the well casing or flowing directly into the well. This type of construction also makes the well very susceptible to contamination by small animals and insects.

Well pits can be a deadly safety hazard and should not be used for storage areas. With changes in atmospheric pressure, air from within the well casing can displace breathable air in the well pit. Methane gas may also build up in the pit creating potentially dangerous situations such as explosions. Well gases or low oxygen content in well pits have resulted in human deaths as people entering these well pits become asphyxiated. It is strongly recommended that well pits be removed by an experienced backhoe or well drilling contractor and **pitless adaptors** be installed.



Well pits are no longer used in new well construction — *Courtesy of PFRA*

FARM WATER HYDRANTS INSTALLED IN A WELL OR WELL PIT

Hydrants are designed to prevent freezing by draining water from the hydrant standpipe whenever the hydrant is shut off. If a hydrant is installed in a well casing or well pit, the contents of the standpipe will siphon back into the well. If a hose is directly connected to the hydrant and the other end of the hose is in a stock tank or pesticide sprayer tank, the contents of the tank will be siphoned down the well. The contents of stock tanks or sprayers are definite contaminants. Always maintain an air gap between the end of a hose and the water surface, and disconnect hoses from the hydrants when not in use. Using a hose connection vacuum breaker on every hydrant can also provide additional protection.

3.1.5 Flowing Wells

The water from flowing wells must be controlled to prevent depletion of the water resource. Free-flowing water wells in some areas of the province have drastically lowered water levels in neighbouring wells, wasted the resource and contributed to saline soil conditions in the overflow area.

Under the *Water Act*, flowing wells must be controlled. Ideally the flow should be shut off when the water is not in use. The regulations require that the flow rate does not exceed either the water requirements of the well owner, or 100 cubic metres per week (2.18 gal/min), whichever is smaller. If the flow requirement exceeds 100 cubic metres per week, the water use must be licensed.

Restricting the flow can be accomplished by a variety of methods. Talk to a well driller or plumber about the most practical method for your situation.

3.1.6 Old and Abandoned Wells

A great number of rural residents rely on water wells. While the exact number of **abandoned wells** in Alberta is unknown, it is estimated to be in the tens of thousands. Abandoned wells that are no longer used or maintained for future use pose a serious threat to the preservation of groundwater quality. They are also a serious safety and environmental hazard for children and animals.

Old wells may be poorly constructed or have a rusted steel casing that can lead to the contamination of aquifers and neighbouring wells. When the steel casing of an abandoned well starts to corrode, holes will develop. When this situation occurs, surface contaminants or poor quality water from shallow aquifers may migrate into the deeper aquifers of nearby operating wells.

Unfortunately, groundwater contamination and its effects are usually not recognized until groundwater quality is seriously affected and nearby wells have been contaminated. Surface contaminants can enter a well directly through the top of the casing, if there is not a proper **well cap**, or through unsealed spaces along the outside of the casing.

Old and abandoned wells should be decommissioned or plugged to prevent the following problems:

- downward movement of water in the well or well annulus
- surface contamination from reaching aquifers
- intermixing of water between aquifers of different water quality

WHO IS RESPONSIBLE?

In Alberta, responsibility for plugging a water well is defined by legislation. The drilling contractor is legally responsible for immediately plugging a well that is not completed due to construction problems or inadequate yield. The well owner is responsible for plugging the well when:

- the well is no longer being used as a water supply
- the well is in a poor state of repair and the pumping equipment has been removed or cannot be repaired or replaced
- the well produces water that is unsuitable for drinking

Unless you use the right plugging materials and have them properly placed in the well, you will end up with a poorly sealed well that can allow contaminants to enter the groundwater. It is generally best to hire a drilling contractor to complete the plugging of your well. This person has the expertise and equipment to do a proper job.

3.2 Dugouts

Dugouts are often used on farmsteads as a water source. If the site has a low, poor quality groundwater supply, dugouts may be used exclusively, or in combination with a well. If a farmstead has both, the well water is usually saved for household use because it is typically of better quality.

Dugouts are usually filled by surface water and can provide good quality water for livestock and irrigation purposes. However, there is a greater risk of contaminants entering the dugout as many are typically filled by spring runoff or water from irrigation canals, creeks, rivers or lakes. Some dugouts are groundwater-filled and may pose a higher risk of groundwater contamination and should be managed accordingly. It is important to always monitor a dugout's water quality.

Dugout fenced to protect water quality — *Courtesy of AAFRD*

Generally, dugouts have high levels of organic matter, but surface runoff high in particulate matter and plant nutrients increase these levels. This situation results in significant algae and weed growth, eventually resulting in poor water quality. Thus, it is important that dugouts be monitored, maintained and treated to avoid water quality issues.

Traditionally, dugout water was not treated or treatment consisted of a combination of chlorination, rapid sand filtration and/or granular activated carbon filtration. However, better water treatment systems exist today and include conventional treatment systems involving chemical coagulation. Coagulation is the process of adding chemicals to the dugout water to reduce turbidity, dissolved organic compounds and colour. The chemicals cause small particles to bind together forming larger particles that can be removed from the water either through sedimentation or direct filtration. This treatment can occur in dugouts or coagulation cells that treat a six to twelve-month supply of household water.

Dugouts that are only filled by spring runoff should be designed to hold at least a two-year water supply plus any additional evaporation and **seepage** losses, unless an alternative water source can be used to fill the dugout in a drought year. Dugouts in irrigated areas or adjacent to rivers or lakes must be at least large enough to supply water from the time the water is not available in the fall until water flows again in the spring.

The size of a dugout required for a livestock operation varies with the water requirements of the operation, the refill frequency of the dugout and assessments of seepage and ice thickness. Seepage losses from dugouts do occur and are variable. Dugout evaporation ranges from 15 percent in northern Alberta to 30 to 50 percent in southern Alberta, while dugouts used for winter water supplies will lose approximately 25 percent to ice. A deeper dugout with steep slopes will provide the best water quality and help minimize such losses.

Knowing your dugout capabilities helps you determine the best dugout use for your farmstead. Other things to know:

- dugout purpose
- age
- size
- approximate water volume
- potential problems with seepage, quality or inadequate runoff

Some dugouts may require licensing by Alberta Environment. Check with Alberta Environment to ensure all legislative requirements are met when planning any of the following situations where dugouts are:

- constructed in **waterways**
- intercepting groundwater
- over 12,500 cubic metres (2,749,615 gallons) in size
- using more than 6,250 cubic metres (1,374,807 gallons) of water a year

Contact your local Agriculture and Agri-Food Canada - Prairie Farm Rehabilitation Administration (AAFC-PFRA) and Alberta Agriculture Food and Rural Development (AAFRD) water specialists for proper dugout planning and design information.

3.2.1 Management of Inflow Water into Dugouts

If you are planning to fill the dugout from runoff or an irrigation canal, be sure to:

- locate the dugout upstream of any livestock area
- construct a berm around the dugout (if filled from irrigation water) to prevent potential runoff from entering water supply
- fence the dugout to prevent animals from entering the water supply
- install a pumping system with a floating intake
- aerate to prevent the water from becoming stagnant

A dugout in the middle of a waterway becomes a sediment trap and silts in more quickly. Wherever possible, dugouts should be located beside the water runway and have a short water diversion channel connecting the two. This set-up allows you to control the water that flows into the dugout, while unwanted or contaminated water can be redirected to bypass the dugout. For more information on planning, designing and operating dugouts, refer to AAFRD publications listed at the end of this chapter.

3.3 Natural Water Sources

Natural water sources exist on many farmsteads and include undeveloped springs, lakes, wetlands, creeks and sloughs. These may be locations where water flows year round, intermittently or seasonally. Managing for healthy water sources ensures a **sustainable** water supply for the future.

The concern when dealing with natural water sources is the distance of potential hazards, such as pesticides, fertilizers or manure to the water source. For example, when animals have direct or limited access to a spring or creek, the risk for contamination increases. Animals may affect the quantity or outflow of the water source. Creating pasture **riparian areas** and other **buffer zones** allows you to manage and maintain water quality. Offsite livestock watering systems, such as solar and nose pumps, will also protect water sources from potential contamination.

Alternative livestock watering systems such as nose pumps help protect water sources from contamination risks — *Courtesy of AAFRD*

3.4 Pipelines

Some rural residents are supplied with water from community pipelines, which either deliver treated potable water or untreated raw water.

If the pipeline supplies treated water, the major concern is maintaining the water quality once it is at the farmstead. Most pipelines deliver a low volume of water (often 1-2 gallons per minute) to a cistern at the farm site. It is important that the cistern be secure with a cover to prevent access by rodents, insects, children, etc. or contaminants from entering the water supply.

Clean and disinfect your cistern at least once a year:

1. Drain and clean the tank.
2. Inspect for cracks or leaks as water can leak both in or out.
3. Fill the tank with potable water.
4. Disinfect with 100 mg/l chlorine solution with 8 litres of household bleach per 4500 litres (1000 gal) of water.
5. Run water out of each water line to get the bleach into the entire piping system.
6. Let sit for at least 20 minutes.
7. Drain the chlorinated water from the tank.
8. Refill with potable water.

If your pipeline supplies untreated water to the farmstead, make sure the water is treated appropriately, so the water becomes suitable for home use. Many treatment systems are available for a variety of water problems. Check with a AAFC-PFRA or AAFRD water specialist or health inspector to determine what options may be best for you.

Any community pipeline system should be protected from **backflow** and **cross connections** that may originate at a farm. This precaution usually involves backflow prevention devices that are specified by the utility that supplies the water. These are designed to keep contaminated water from being pumped or "sucked" into the pipeline.

Shallow buried pipelines that are not designed for year round use are more susceptible to contamination and breaks. Proper backflow prevention is strongly recommended for farms that use these shallow buried pipelines to supply water to livestock pastures. Prevention may be as simple as maintaining an air gap at the float valve or installing a special backflow preventer.

As mentioned previously, it is very important to test all farm water sources on a regular basis, including water supplied from community pipelines as potential contamination of the water source may occur at different points along the pipeline.

3.5 Legislation

Producers should be aware of the following pieces of legislation that pertain to water sources and the potential environmental risks. For more information on the legislation, refer to Chapter 12 of this manual.

Federal Legislation

Fisheries Act

Provincial Legislation

Water Act
Environmental Protection and Enhancement Act

3.6 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697

- Aerating Dugouts with Compressed Air Agdex 716 (B36)
- Algae Control for Ponds Agdex 485/716-2
- Dugouts for Farm Water Supplies Agdex 716 (B30)
- Farm Water Supply Requirements Agdex 716 (C01)
- Float Suspended Intake Agdex 716 (B34)
- Hydrated Lime for Algae Control in Dugouts Agdex 716 (B37)
- Quality Farm Dugouts Agdex 716 (B01)
- Water Wells that Last for Generations Agdex 716 (A10)

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Environment

Publications: 780-427-2700

- Prevention of Water Contamination by Pesticides
- Water Act: Fact Sheets

Groundwater Information Centre: 780-427-2770
Website: www.gov.ab.ca/env

Agriculture and Agri-Food Canada

Publications: 613-759-6610

- The Health of Our Water No. 2020E
- Water Wells – Maintaining a Valuable Prairie Resource

Website: www.agr.gc.ca/pfra

Agriculture and Agri-Food Canada – Prairie Farm Rehabilitation Administration

Publications: contact your regional office

- Dugouts for Farm Water Supplies
- Rural Water Quality and You Information Sheets
- Shelterbelts for Dugouts
- Water Quality Matters Fact Sheets
- Wells for Farm Water Supplies

Website: www.agr.gc.ca/pfra

Department of Fisheries and Oceans

Publications: contact your regional office

- Alberta Operational Statement
- Culvert Maintenance
- Isolated Ponds
- The Fish Habitat Primer – Prairies Edition

Website: www.dfo-mpo.gc.ca

Health Canada

Publications: 1-800-635-7943

- Guidelines for Canadian Drinking Water Quality

Website: www.hc-sc.gc.ca

The Groundwater Centre

Office: 1-800-GEO-WELL (436-9355)
Website: www.groundwatercentre.com

CHAPTER 4.0

Pesticide Storage, Handling and Application

This chapter discusses beneficial management practices that address storage, handling and application of pesticides on the farmstead.

Pesticides provide producers with effective means to control weeds and pests such as insects and rodents, as well as bacteria, fungi, parasites and pathogens. If not managed properly, pesticides can pose serious environmental and health safety risks. Understanding potential hazards associated with pesticides and properly storing, handling and applying them can minimize or even eliminate any potential risks that may exist on your farm.

4.1 Pesticide Storage

The best way to eliminate any environmental risk associated with pesticide storage is to avoid storing pesticides on the farmstead. If you cannot use the pesticide within a reasonable time, then make arrangements with your supplier for storage, or minimize the volumes you have by sharing the extra pesticide with your neighbours. When storing or transporting pesticides, the best practice is to keep the pesticide in the original container with all labelling clearly visible. Always ensure the container is transported with **secondary containment** to catch any spills or leaks.

If you must store pesticides, do so with the following guidelines in mind:

- Store minimal amounts of product. Storage time should not exceed the growing season.
- Use secondary containment made of an **impermeable** material to contain possible leaks. For example, store chemical jugs in tubs or trays on storage shelves.
- All original containers must retain manufacturers' labels, and any secondary containers must also be properly labelled, detailing the contents and date.
- Consult the pesticide label for specific storage instructions.
- Do not store with or near food, feed, seed, drinking water, protective equipment or emergency response equipment.
- Store and handle pesticides at a distance greater than 30 m (98 ft) from a water body and 90 m (295 ft) from a water well.
- Return unopened or non-compromised product to the dealer for a refund.
- If a product container is leaking, overpack the container by packing it in a larger container with leak collection material (such as kitty litter) until it can be properly transferred to a good container.
- Dispose of opened leftover product as a hazardous waste. For more information, refer to Chapter 8.

4.1.1 Storage Facilities

When storing pesticides, ensure the facility:

- Is secure with signs posted indicating the storage contents.
- Is constructed to minimize or eliminate potential soil and water contamination by having curbs and an impermeable floor to contain spills and leaks.
- Does not have a floor drain, unless there is a proper holding tank for drainage collection. If there is a tank, it should be monitored regularly, and the fluid disposed of in accordance with hazardous waste regulations.

Store chemicals in a secure facility with appropriate signage — *Courtesy of AAFRD*

4.2 Large and Small Scale Pesticide Handling and Application

Activities that may affect the environment in and around a farmstead could range from mixing and loading of field sprayers to applications in a livestock yard, garden or surrounding field.

Whether dealing with large or small amounts of pesticides, use the following guidelines to reduce contamination and toxicity risks:

- Identify the problem and determine if the use of a pesticide is the only option or if there are other mechanical or biological means of control.
- If the use of a pesticide is the only option, choose the least toxic, most appropriate chemical for your situation.
- Read and follow product label directions as outlined by the manufacturer for:
  - proper mixing procedures
  - recommended application methods, rates and timing
  - application restrictions for weather conditions
  - use restrictions for cropping, grazing or harvesting
  - special safety precautions and equipment
  - proper disposal procedures for leftover product
- Record chemical type, rates and methods used as well as weather conditions, growth stages of crop and pests and application purpose for future reference.

4.2.1 Mixing and Loading Locations

The best option is to mix and load pesticides near the application site to minimize the risk of water or soil contamination. Any mixing and loading areas must be more than 30 m (98 ft) from a surface water body and more than 90 m (295 ft) from a water well. If you are mixing pesticides at a regular site on your farmstead, make sure the site is designed to contain spills and leaks.

When loading pesticides, remember to:

- Never leave filling procedures unattended (someone over the age of 16 must be present at all times).
- Have spill containment and cleanup equipment ready, such as an absorbant material like kitty litter.
- Have a cell phone or two way-radio available (if possible) for emergencies.
- Prevent backflow from the sprayer to the water source:
  - Never place a hose into the sprayer tank or container below the water line.
  - Install backflow preventer devices on all water lines leading to the storage area and pad.
  - Fit spray equipment with an operational backflow preventer.

4.3 Cleaning and Maintaining Application Equipment

To reduce or eliminate risks associated with equipment problems, plant damage or animal toxicity, it is important to clean and maintain all chemical application equipment. This practice ensures pesticide efficacy, as well as reduces risks associated with cracked hoses and leftover residue. Any chemical residues in spray containers or tanks can potentially contaminate other pesticides used in other applications.

When preparing for the next pesticide application:

- Inspect and perform regular maintenance checks on all equipment.
- Calibrate application equipment.
- Clean and rinse all parts of the application equipment thoroughly with water or other solution as advised by the product label.
- Designate sites to clean, flush and rinse the equipment.
- Dispose of the **rinsate** according to product label directions:
  - If possible, apply rinsate directly to treatment area.
  - If you cannot apply it on the treatment area, then:
    - Apply it on land away from surface water, water wells, septic systems, gardens, shelterbelts and other environmentally sensitive areas.
    - Use it as mix water for later applications when the same chemical is being applied.
    - Apply it on areas requiring pesticide control.

Dispose of rinsate away from environmentally sensitive areas — *Courtesy of AAFRD*

4.4 Transporting Pesticides

The *Transportation of Dangerous Goods Act* applies when transporting pesticides on public roads. However, it is best to have your local vendor deliver pesticides to the place of use. If delivery is not an option, safely secure all pesticides before and during transportation. Never leave pesticides unsupervised in a vehicle, unless the chemicals are located in a place inaccessible to the public or in an enclosed compartment of the vehicle. Remember to never transport pesticides with food, feed, household furnishings, toiletries, clothes, bedding or similar items.

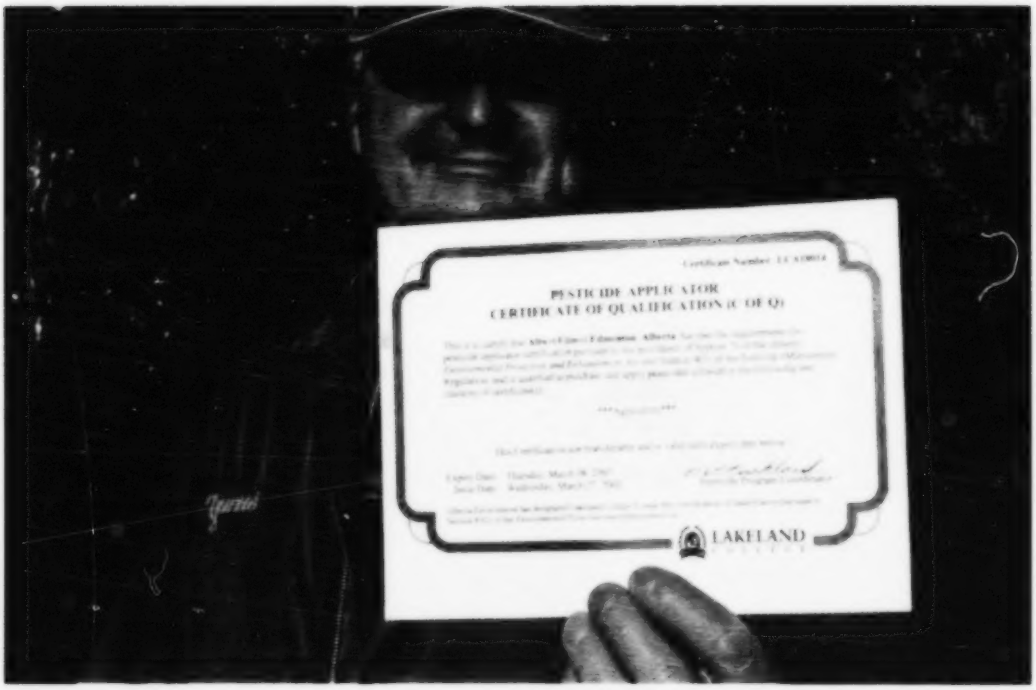
4.5 Custom Applicators

A beneficial management practice is to hire a custom applicator to reduce risks with pesticide application. Custom pesticide applicators have attended and passed a pesticide applicator course and may lawfully offer pesticide services to others. As a producer, you have the legal responsibility to ensure that any pesticide application performed on your property does not harm adjacent properties or people. By hiring a custom applicator and working with them to control pests and weeds on your farm, you are minimizing your environmental risk.

4.6 Pesticide Training

Voluntary pesticide training and certificate courses are available for Alberta producers. The training provides you with the knowledge to safely and effectively use pesticides, from understanding how they work (mode of action) to clean-up and disposal. Some pesticides require producers to obtain special certification before they purchase and use these products on their own property. By taking a pesticide application course, you also learn about the risks associated with pesticide use. Knowing and understanding these risks will help you eliminate or reduce any environmental risk when working with pesticides on your operation.

For more information on these courses, contact your local agricultural college.



Obtaining a Pesticide Applicator Certificate eliminates or minimizes environmental risks when working with pesticides — *Courtesy of AAFRD*

EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

4.7 Legislation

Producers should be aware of the following pieces of legislation that pertain to pesticides and the environmental risks associated with their use. For more information on legislation, refer to Chapter 12 of this manual.

Federal Legislation

Fisheries Act

Pest Control Products Act

Transportation of Dangerous Goods Act

Provincial Legislation

Agricultural Pests Act

Environmental Protection and Enhancement Act

Weed Control Act

4.8 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697

- Crop Protection – the Bluebook Agdex 606-1
- How Herbicides Work: Biology to Application Agdex 606-2
- Protect Groundwater Quality – Minimize the Risks Agdex 576-5

Neil Crawford Alberta Government Library: 780-422-7689

- Impacts of Farm Inputs (video loan)

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Environment

Publications: 780-427-2700

- Disposal of Treated Seed
- Focus on Pesticides
- Guidelines for Mobile Pesticide Storage Facilities
- Pesticide Container Collection Program
- Pesticide Regulation Factsheets
- Pesticide Services
- Pesticide Storage: Regulatory Requirements and Guidelines
- Pesticide Waste Disposal for Commercial Pesticide Applicators, Services and Vendors
- Prevention of Water Contamination by Pesticides

Direct all pesticide complaints or reports of spills/releases to Alberta Environmental Response Centre at the 24-hour-toll free line: 1-800-222-6514.
Website: www.gov.ab.ca/env
Pesticide Management: www3.gov.ab.ca/env/protenf/pesticide

Alberta Transportation

Publications: 1-800-272-9600

- Dangerous Goods and the Agricultural Industry

Website: www.trans.gov.ab.ca

Queen's Printer

Phone: 780-427-4952

- Environmental Code of Practice for Pesticides

Website: www.qp.gov.ab.ca

Pest Management Regulatory Agency

Publications: 1-800-267-6315

- Regulation of Pesticides in Canada

Website: www.pmra-arla.gc.ca

CropLife Canada

Publications: 416-622-9771

- Pesticide Safety Handbook

Website: www.croplife.ca

CHAPTER 5.0

Fertilizer Storage, Handling and Application

This chapter discusses beneficial management practices that address storage, handling and application of fertilizers on the farmstead.

Fertilizers are organic and inorganic forms of nutrients that are used to support plant growth. Types of fertilizers include solid fertilizers (such as granules, crystals and pellets), liquid fertilizers and anhydrous ammonia (a compressed gas that is liquefied under pressure).

The potential hazards in fertilizers are the nutrients and salt concentrations within them. Two main concerns regarding fertilizer on the farm are the storage of the product and their use within the farmstead area.

5.1 Dry Fertilizer Storage

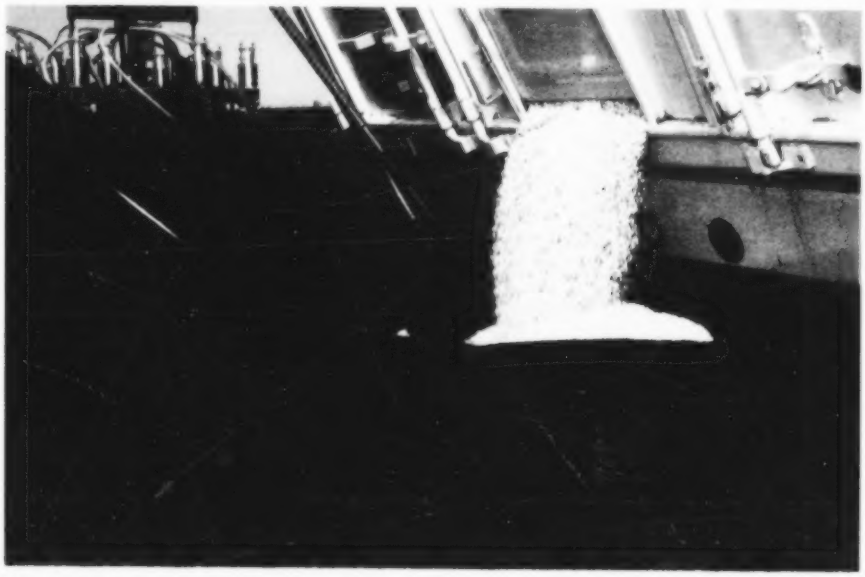
To properly store dry fertilizer, you need to:

- Avoid storing fertilizers with drinking water, food, fuel, seed, animal feeds or protective equipment to prevent contamination.
- Locate storage facility more than 100 m (330 ft) from water wells and more than 20 m (60 ft) from surface water bodies.
- Store on an impermeable surface such as sealed concrete. For field operations, storage should be in a building or epoxy-lined bin.
- Post signs stating the contents of the storage facility for large fertilizer amounts in case of an emergency or fire.
- Maintain and monitor the storage area, checking regularly for fertilizer leaks and spills.
- Ensure the storage facility is secure when storing large amounts of fertilizer. Building or storage bins should be separate from all other activities that could damage containers or spill fertilizer. This could mean a locked fenced area.

5.2 Liquid Fertilizer Storage

To properly store liquid fertilizer, you need to:

- Inspect all tanks, valves and plumbing used for large liquid fertilizer storage regularly.
- Ensure that you have adequate secondary containment to hold any spills or leaks.
- Use sight gauges and lock-on valves on large storage containers.



Use proper procedures and precautions when loading fertilizer at all times — *Courtesy of PFRA*

5.3 Fertilizer Mixing and Loading

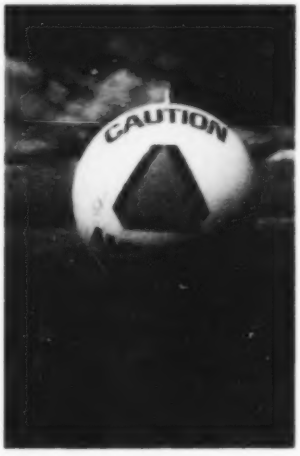
When mixing and loading fertilizers, it is inevitable that a spill will occur. Using proper clean up procedures and precautions to minimize spills, you will reduce or eliminate environmental risks.

Follow these guidelines for proper fertilizer mixing and loading:

- Never leave filling procedures unattended.
- Ensure loading takes place at least 30 m (98 ft) away from a well or surface water.
- Clean up spills when they occur.
- For dry fertilizer, if you use a permanent mixing and loading area, the mixing pad should be impermeable. Sweep up any spilled dry fertilizer, and store it in a clean container until it can be used.
- For liquid fertilizer, if you use a permanent mixing and loading area, ensure that any spills or leaks can be collected and contained. The mixing pad should have an impermeable floor, curbs and a sump. Liquids from the sump can be used for future applications.
- For mixing liquid fertilizers, either have a backflow preventer on the water supply or ensure that there is a 15 cm (6 in) air gap between the hose and water source or supply. If possible, use a **closed handling system** to transfer the fertilizer directly from the storage container to the applicator equipment, so people and the environment are not exposed to the fertilizer.

5.4 Anhydrous Ammonia

Anhydrous ammonia is a corrosive, compressed gas that is liquefied under pressure. It can present significant health and safety risks if not handled and stored properly. Handlers and applicators should ensure all equipment is inspected prior to use, checking for properly functioning valves, breakaway couplers and ensuring all high-pressure hoses are free of cracks or wear. It is also very important never to assume all pressure has been released from hoses when working around equipment or when connecting or disconnecting hoses.



Anhydrous ammonia tank
— Courtesy of AAFRD

Many regulations are in place to keep the use of anhydrous ammonia safe. All equipment and parts used for storing, transporting and applying anhydrous ammonia must be registered and inspected on a regular basis to meet strict design standards and pressure tests. Under federal law, anyone handling, offering for transport or transporting anhydrous ammonia must also complete Transportation of Dangerous Goods (TDG) training every three years.

Growers are responsible, as employers, to ensure anyone handling anhydrous ammonia on their farm receives TDG training, which is offered through most anhydrous ammonia retailers. Finally, anhydrous ammonia retailers have put 24-hour emergency response teams into place to ensure the safety of communities, equipment and the product.

5.5 Application of Fertilizers

To avoid potential risks associated with the application of fertilizers, ensure **application rates** do not exceed plant requirements. Too much fertilizer is not only economically wasteful, but nutrients applied beyond plant use may be lost. Nutrients lost through leaching and runoff may potentially contaminate surface water or groundwater sources. Ensure that fertilizer application rates are calculated and based on soil nutrient content and plant nutrient needs. Using soil tests to ensure proper amounts of nutrients are applied can help you reduce the level of environmental losses associated with excessive nutrients and extra costs associated with high application rates.

Many factors may affect the amount of nutrients available in the soil. These factors include plant type, soil type and soil moisture, as well as climatic factors such as rainfall, temperature and sunlight. Management factors that affect fertilizer nutrient availability include nutrient sources, application methods (broadcasting versus banding) and timing (spring versus fall).

EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

5.6 Legislation

Producers should be aware of the following pieces of legislation that pertain to fertilizers and the environmental risks associated with their use. For more information on legislation, refer to Chapter 12 of this manual.

Federal Legislation

Transportation of Dangerous Goods Act

Provincial Legislation

Agricultural Operation Practices Act

Environmental Protection and Enhancement Act

5.7 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697

- Managing Nitrogen to Protect Water Quality Agdex 576-1
- Minerals for Plants, Animals and Man Agdex 531-3
- Protect Groundwater Quality – Minimize the Risks Agdex 576-5

Neil Crawford Alberta Government Library: 780-422-7689

- Fertilizer and the Environment (video loan)
- Impacts of Farm Inputs (video loan)

Ag-Info Centre: 1-866-882-7677
Website: www.agric.gov.ab.ca

Alberta Transportation

Publications: 1-800-272-9600

- Dangerous Goods and the Agricultural Industry

Website: www.trans.gov.ab.ca

Canadian Association of Agri-Retailers

Publications: 204-989-9300

- Fertilizer Storage and Handling

Website: www.caar.org

Canadian Fertilizer Institute

Publications: 613-230-2600

- Canadian Fertilizer Industry Storage and Handling Guidelines 2001

Website: www.cfi.ca

CHAPTER 6.0

Fuel Storage and Handling

This chapter discusses beneficial management practices that address storage and handling of all petroleum products on the farm.

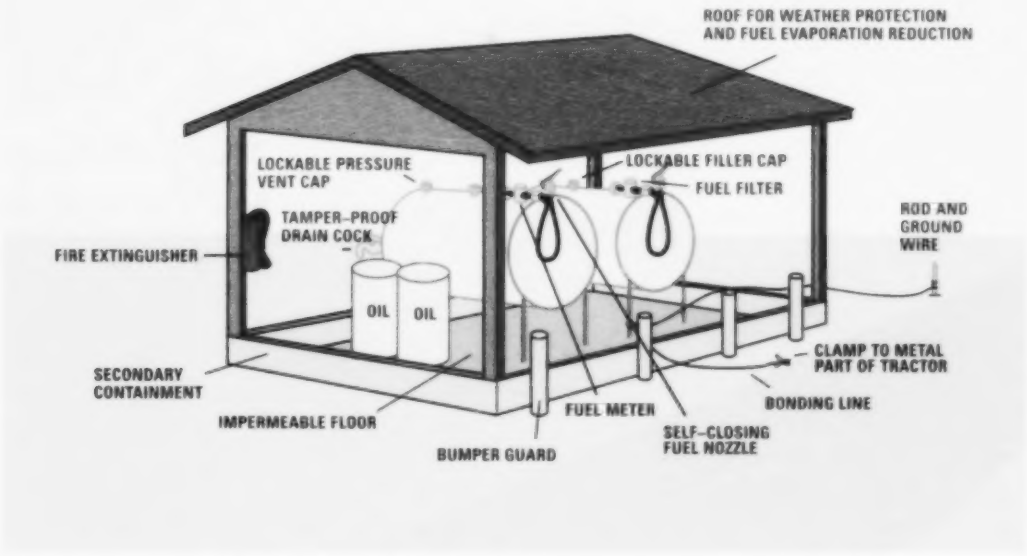
Diesel, gasoline, lubricants and oils are used extensively on farms today. In Alberta, there are at least 250 million litres of diesel and gasoline storage. Financial (increasing costs), environmental (potential for spills and leaks) and safety (potential fires) concerns are associated with handling and storing fuel on the farm.

At present, the *Alberta Fire Code* governs the storage and handling of petroleum products. Although Alberta producers are exempt from the *Code*, its standards are used as guidelines for producers to follow as beneficial management practices.

6.1 Siting and Setup

Proper siting and setup of your storage area is important in minimizing or eliminating risks associated with handling fuel (see Figure 6.1). When determining fuel storage locations on your farm, keep minimum separation distances from areas that could be affected by fire and fuel leaks and spills. Prior to installing storage tanks or facilities, ensure equipment such as tanks, support stands and dispensers are in accordance with the *Alberta Fire Code*.

FIGURE 6.1 A WELL PLANNED FARM FUEL STORAGE SITE



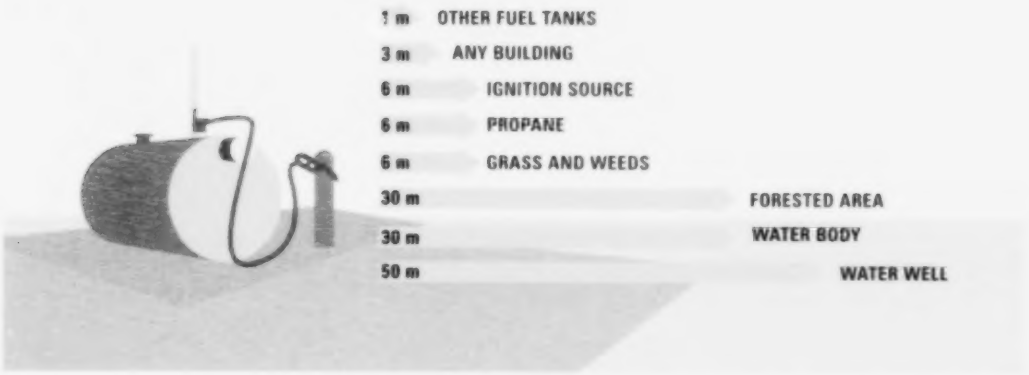
Courtesy of Resource Management Branch, British Columbia Ministry of Agriculture and Lands. Adapted.

6.1.1 Minimum Separation Distances

Fuel storage areas should be located well away from buildings, trees, ignition sources, other fuel tanks, water bodies and water sources to reduce environmental and safety risks. Keeping the storage area free of vegetation and away from buildings and ignition sources helps reduce the danger to fuel tanks in the event of a fire. Ignition sources include electric motors, road traffic, yard lights, power lines, cell phones, air conditioning or heating units and garbage burning barrels.

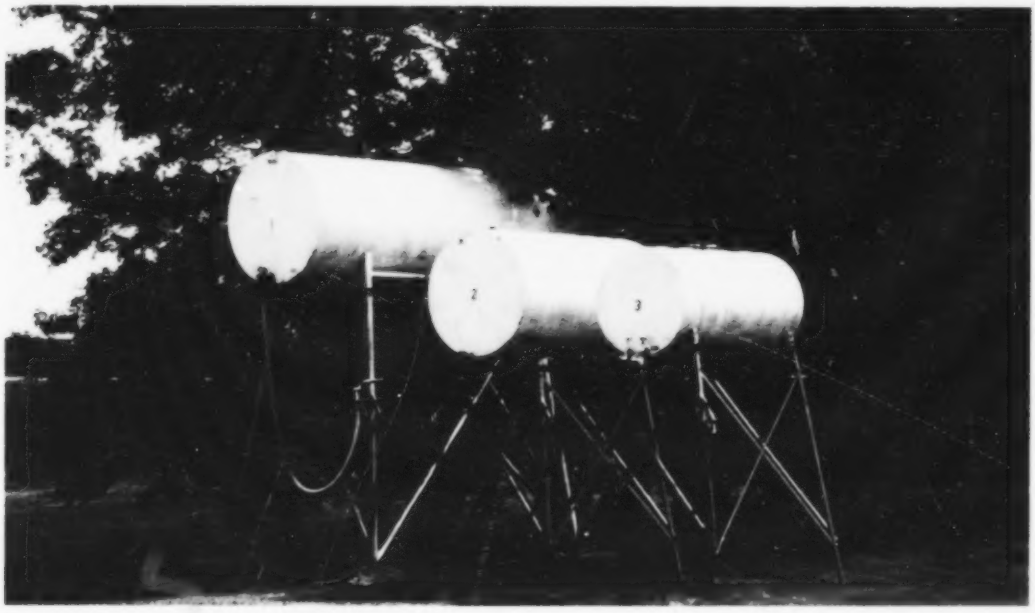
The following diagram (Figure 6.2) provides guidelines for distances when siting petroleum storage.

FIGURE 6.2 MINIMUM SEPARATION DISTANCES FROM FUEL STORAGE AREAS


1 m OTHER FUEL TANKS
3 m ANY BUILDING
6 m IGNITION SOURCE
6 m PROPANE
6 m GRASS AND WEEDS
30 m FORESTED AREA
30 m WATER BODY
50 m WATER WELL

6.1.2 Stands

Typically, many farm sites in Alberta have gravity-fed tanks on stands 1 to 3 m (4 to 9 ft) high. These tanks tend to become unstable because of the weight of the fuel, or they melt due to a fire, resulting in a spill. The best practice is to mount tanks at ground level, or on solid concrete or steel supports no higher than 0.3 m (1 ft) off the ground. Supports should provide a minimum two-hour fire-resistant rating and be on a firm foundation to help prevent uneven settling.



Aboveground or gravity-fed tanks located too close to trees increase fire hazards and damage from fallen trees — *Courtesy of AAFRD*

6.1.3 Secondary Containment

As a safety precaution, secondary containment that contains 110 percent of the maximum volume of the storage tank is recommended. Installing a double-walled tank or using a diking system can accomplish this goal.

Double-walled tanks provide excellent protection against leaks and also provide thermal insulation, reducing extreme changes in fuel temperature. Each double-walled tank has a space between two walls that will contain 10 percent more volume than the storage capacity of the tank.

A dike is an impermeable spill containment area or berm constructed of earth, steel, concrete, solid masonry or synthetic liner that will also hold 110 percent of the tank capacity. If there is more than one tank, then the containment area must hold 110 percent of the largest tank, or the capacity of the largest tank plus 10 percent of the total volume of the remaining tanks, whichever is greater.

6.1.4 Evaporation

Losses due to evaporation vary with the type of storage, fuel and management practices to prevent evaporation. Fuel losses range from minimal in underground tanks, to maximal in poorly located or maintained overhead tanks. The heating of aboveground tanks from the sun causes the fuel to evaporate (volatilize) into the atmosphere. The more the fuel temperature changes, the greater the potential for fuel losses and risk of contamination due to condensation. Evaporation losses are greater for gasoline than diesel because gasoline is more volatile. For estimations of evaporative losses due to different tank conditions in summer months for aboveground storage, refer to Table 6.1.

TABLE 6.1 EVAPORATIVE LOSSES FROM A 1,200 LITRE (265 GALLONS) ABOVEGROUND GASOLINE STORAGE TANK

TANK CONDITIONS			EVAPORATION LOST PER SUMMER MONTHS		% OF FULL TANK LOST
			Litres	Gallons	%
Dark tank	in sun		38	8.4	3.2
White tank	in sun		23	5.1	1.9
Dark tank	in sun	with pressure vent cap	21	4.6	1.8
White tank	in sun	with pressure vent cap	9	2.0	0.8
Dark tank	in shade		9	2.0	0.8
White tank	in shade	with pressure vent cap	5	1.1	0.4
FOR COMPARISON PURPOSES:					
Underground tank			< 4	< 1	0.3
Double-walled aboveground tank			Losses similar to underground tank		

Source: Farm Storage and Handling of Petroleum Products, Farm Mechanization Factsheet No. 210.510-1, Resource Management Branch, British Columbia Ministry of Agriculture and Lands.

The following steps reduce fuel evaporation losses:

- Paint the tank with reflective paint (silver or white) and reduce evaporation losses by up to 40 percent compared to a dark-coloured tank.
- Use a pressure ventilated cap to reduce evaporation losses by 50 percent. This type of cap restricts direct venting of tank fumes until a slight pressure has built up in the tank. Having a painted and pressure-vented tank has a 75 percent evaporation loss reduction compared to a dark-coloured tank.
- Locate a painted and pressure-vented tank in the shade to further reduce evaporation losses by over 40 percent. A shelter with a roof also helps reduce weathering of hoses and valves (see Figure 6.1).
- Do not fill the tank to more than 90 percent of its capacity; this practice reduces pressure in the tank, and thus, evaporative or spill losses.

6.2 Dispensing Fuel

Care and caution should be taken while fuelling vehicles, farm machinery or jerry cans.

To reduce spills and avoid fires, use the following procedures when dispensing fuels:

- Ensure the dispenser unit is **ULC and CSA approved**, with automatic shut-off valves.
- Use a hand or electric pump. If using an electric pump, it must be installed according to the Code of Electrical Installations at Oil and Gas Facilities.
- Close the valves on tank discharges when they are not in use to prevent leakage through the hose or nozzle.
- Never leave the area unattended even if automatic shut-off nozzles are being used. There is always the possibility of nozzles malfunctioning or getting knocked out of the tank.

6.3 Fuel Tank Safety

To prevent further fuel losses from occurring, you need to regularly maintain and monitor storage facilities by taking the following additional precautions:

- Protect tanks and piping against corrosion to prevent leaks.
- Protect all pumps, lines and tanks from collision damage by installing **bollards** (barriers constructed of a sturdy material, such as steel piping filled with cement, set up close to fuel tanks to guard against collision damage).
- Make sure fill-up hoses are long enough, so vehicles and farm equipment can be kept at a safe distance from the tanks.
- Keep fuel lines, hoses, valves and nozzles in good repair. Install anti-siphon valves between the pump and tank to prevent the tank from draining if the line breaks.
- Lock all fuel tanks when not in use to reduce the risk of spills caused by vandalism or theft.
- Ground the pumps and vehicles to avoid build up of static electricity, explosions and fires. Attach a bonding line to the vehicle prior to filling it from an aboveground fuel storage tank to reduce the risk of static electricity igniting fuel vapours (see Figure 6.1).

JUST IN CASE OF A FIRE

To effectively fight a fire, first you need to know what type of fire you are dealing with:

Class A – involves ordinary combustibles such as wood, paper, cloth, plastic, etc.

Class B – involves flammable and combustible liquids such as grease, gas, oils, paints, etc.

Class C – involves electrical equipment such as appliances, computers, breakers, motors, switches, etc.

Class D – involves burning metals such as aluminum, magnesium, sodium, etc.

Each type of fire requires a different type of fire extinguisher:

Pressurized Water – used for Class A fires, but not for Class B, C and D fires

Dry Chemical – used for Class ABC fires. These include Type ABC and Type BC fire extinguishers.

Carbon Dioxide (CO_2) – used for Class B and C fires, but not for class A and D fires. These extinguishers do not leave harmful residues behind like dry chemical extinguishers.

Metal or Sand – used for Class D fires, but not Class ABC fires. The most common extinguishing agent in this class is sodium chloride, but there are a variety of other options.

Fire extinguishers should be accessible in the case of an emergency and should be checked and maintained on a regular basis. When storing and handling fuel on your farm, ensure a dry chemical such as a 40 pound Type BC or carbon dioxide fire extinguisher is located close enough to the fuel storage site, yet far enough away that the intensity of a fire would not stop you from getting it if necessary.

6.4 Small Containers

Precautions during storage and filling of small containers, such as jerry cans, need to be considered. Small containers should be stored away from direct sunlight and supported in an upright position. They should not be stored in or near living quarters such as basements.

To avoid mixing fuels, place different fuels in different coloured jerry cans. As a general rule of thumb, a gasoline jerry can is red, diesel is yellow and kerosene is blue.

To prevent spills when pouring from a jerry can, use funnels, spill-proof or stop-flow spouts or nozzles. Hand pumps are also available to eliminate or reduce spills and leaks.

6.5 Monitoring for Fuel Losses

To avoid spills and catch leaks, it is recommended that fuel tanks be monitored at least every 2 weeks. The best way to determine if there is a leak is through a visual inspection when walking around the tank, looking for rust spots, stains on the ground or cracks, breaks or bends in the hose.

Another way to determine if fuel losses are occurring is to maintain inventory records. An example of a fuel inventory control sheet is included in Figure 6.3. If the tank is equipped with a meter, an ongoing inventory record, kept for a minimum of two years or as long as the life of the tank, should be updated when fuel is used and added to the tank. The expected volume is compared to the actual volume. This amount is obtained from fuel dipping, which is measuring the amount of fuel in a tank with a dipstick or tape. Do not dip tanks immediately after fuel delivery; allow time for fuel agitation to subside.

FIGURE 6.3 SAMPLE FUEL INVENTORY CONTROL SHEET

Fuel Inventory

Sample Fuel Inventory Control Sheet

TANK 1		
Fuel Type		
Fuel Dips (cm)		97
Actual Volume (L)		2,054
Previous Actual Volume		1,710
Deliveries	+	500
Present Volume	=	2,210
Usage	–	162
Expected Inventory	=	2,048
Actual Volume (from dips)		2,054
Expected Inventory	–	2,048
Today's Variance*	=	+6
Previous YTD Variance*	+	- 52
YTD Variance*	=	- 46
Water Reading (cm)	=	0.5

*A negative variance indicates a fuel shortage.

This value is determined by dipping your tanks with a measuring rod or tape. The measurement is taken in centimeters.

This value is determined from the chart supplied by tank manufacturers. A depth of 97 centimeters converts to a volume of 2,054 litres (for this example).

Obtained from actual volume figures on your last inventory sheet.

Fuel delivered since last inventory sheet.

Previous actual volume plus deliveries.

Fuel removed from the tanks since last inventory sheet.

The amount of fuel you expect to be in your tank (present volume minus usage).

Actual fuel in the tank as calculated from fuel dip.

This figure is the expected inventory as calculated above.

The difference between actual volume and expected inventory.

Cumulative year-to-date (YTD) variance from the last inventory sheet.

Current YTD variance.

The water reading in the tank using water-sensitive paste on the dipstick.

If the tank size is unknown and is not equipped with a meter, it may not be possible to maintain an ongoing inventory record. Allow the tank to sit unused for 24 hours and measure the level of fuel at the start and end of the 24-hour period. Compare the measurements for signs of fuel loss. These measurements will be more consistent if done at least 24 hours after fuel delivery.

Any trend of unexplained losses of fuel or increases may indicate a leak and should be investigated further. You can also verify that a leak is occurring by using water-sensitive paste on the tip of the stick. If water can get into the tank, fuel can get out of the tank.

Despite taking necessary precautions to prevent spills and leaks, they do occur and must be dealt with effectively and efficiently. If a spill does occur, stop the flow as quickly as possible to prevent fuel from entering water bodies or sources and catching fire. Fuel can ignite easily when it overflows a vehicle's tank and comes in contact with a hot exhaust system. Use non-combustible materials such as soil to contain the spill; never use rags or sawdust to absorb it as these materials can easily catch fire. Contact your local fire department if the spill is more than 50 litres (13 gallons). If the spill is greater than 200 litres (53 gallons), as a regulatory requirement, you must report it to Alberta Environment by contacting their emergency department. (For contact information, refer to For More Information at the end of this chapter.)

6.6 Transportation of Fuel

The *Transportation of Dangerous Goods Regulations* regulates the transporting of fuel on Alberta highways.

When transporting fuel in volumes less than 450 litres (combined capacity of all containers), diesel is unregulated. The diesel tank requires only a flammable placard or sticker. A gasoline tank is regulated, and therefore a placard with the UN number, shipping name and label are required.

When transporting more than 450 litres and less than 2,000 litres (combined capacity of all containers) of gasoline or diesel, the tank requires one flammable liquid placard attached to the tank. The UN number for diesel and gasoline are 1202 and 1203 respectively (see Figure 6.4).

FIGURE 6.4 PLACARDS SHOWING FLAMMABLE SYMBOL, CLASS AND UN NUMBER

EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

6.7 Legislation

Producers should be aware of the following pieces of legislation that pertain to petroleum storage and handling and the potential environmental risks. For more information on the legislation, refer to Chapter 12 of this manual.

Federal Legislation

Transportation of Dangerous Goods Act

Transportation of Dangerous Goods Regulations

Provincial Legislation

Environmental Protection and Enhancement Act

6.8 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Environment

General Inquiries: 780-427-2700

Report spills or releases to the Alberta Environment Response Centre 24-hour-toll free line: 1-800-222-6514

Website: www.gov.ab.ca/env

Alberta Municipal Affairs

Safety Services: 1-866-421-6929

- Alberta Fire Code

Website: www.municipalaffairs.gov.ab.ca

Alberta Transportation

Dangerous Goods and Rail Safety Branch: 1-800-272-9600

- Dangerous Goods and the Agricultural Industry

Website: www.trans.gov.ab.ca

Safety Codes Council

General Inquiries: 1-888-413-0099

Website: www.safetycodes.ab.ca

Canadian Standards Association (CSA)

General Inquiries: 1-800-463-6727

- Canadian Electrical Code, Part I (20th Edition), Safety Standard for Electrical Installations

Website: www.csa.ca

Canadian Farm Business Management Council

Publications: 1-888-232-3262

- Planning for and Responding to Disasters in Canada

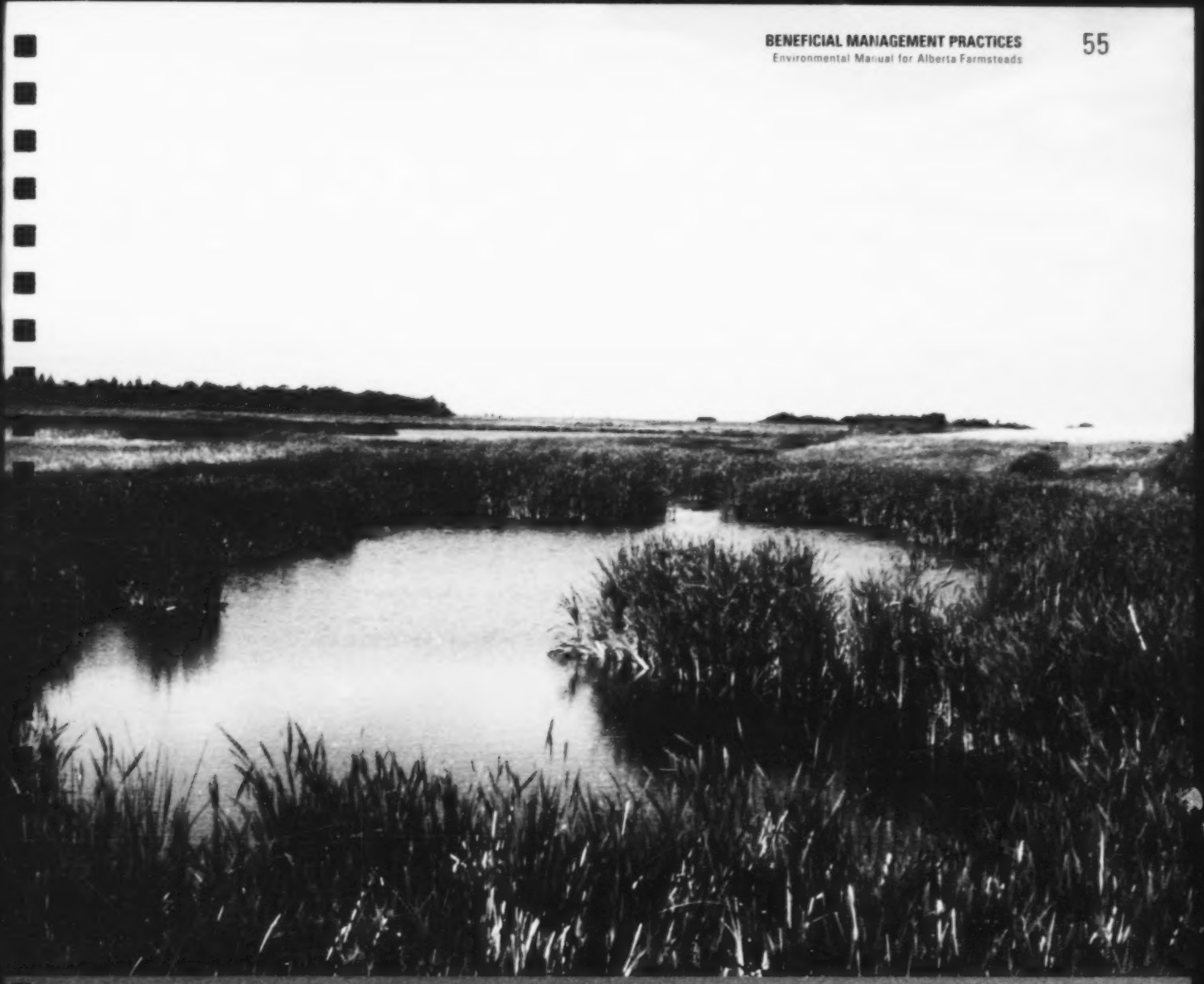
Website: www.farmcentre.com

Petroleum Tank Management Association of Alberta

General Inquiries: 1-866-222-8265

- Farm Tank Brochure

Website: www.ptmaa.ab.ca



CHAPTER 7.0

Surface Water

This chapter discusses beneficial management practices and environmental risks associated with surface water pathways in and around the farmstead.

Surface water flowing onto the farmstead is called run-on and can be a result of runoff from adjacent land, rainfall or snow melt. Some surface water may be absorbed by the soil on the farm site. However, if the soil becomes saturated, then water collecting on the soil surface will flow through the farmstead and become runoff.

If the water comes in contact with potential hazards such as pesticides, fuel, manure or sewage, it can carry contaminants such as chemicals or nutrients with it as it travels. Contaminated surface water should not be allowed to enter or adversely affect any water sources, such as dugouts or wells, or water bodies, such as groundwater, sloughs or streams. Contaminated runoff should not be allowed to travel off farm site property. Pathways, which potentially allow contaminated water to reach water supplies, should be carefully assessed to evaluate the levels of environmental and safety risks that exist. If the levels of risk are too high, then actions are necessary to reduce those risks.

7.1 Surface Water Pathways

When locating new or evaluating existing storage areas, animal facilities, water sources, buildings, septic fields and other facilities on farmsteads, keep in mind the pathways of natural water flow. Consider not only surface water **run-on**, but also surface water runoff pathways (especially if the water could contain contaminants).

Surface water run-on into the farmstead area is occasionally an advantage (when used to fill a dugout), but if run-on flows through potentially contaminated areas, it becomes an environmental risk.

Where surface water run-on and runoff occur, the site must be managed to prevent contamination of watercourses and groundwater. To do this effectively, individual characteristics of each water pathway must be considered, as each pathway is different and will pose different levels of risk.

7.1.1. Water Pathway Characteristics

The topography of the area (slope steepness and length) affects how fast surface water will flow through pathways on the farmstead. For instance, the steeper the hill, the more energy the water has and the faster it flows. This situation creates greater potential for runoff to cause erosion and move contaminants into water supplies or beyond property lines.

Soil types also affect water pathways. Fine-textured soils (clay and silt) have slower water infiltration rates than coarse-textured soils, increasing the amount of surface runoff and posing a greater potential environmental risk to surface water. Coarse-textured soils (sand) with higher infiltration rates result in greater environmental risk to groundwater.

Precipitation influences the amount of run-on and runoff around and on the farm site. When rainfall is intense and/or occurs over a long duration, large amounts of surface runoff can be produced. This increases the risk of water erosion and surface water contamination. Trees and/or snow fences, influencing snow distribution patterns and snow melt, can change the amount of spring runoff and infiltration that occurs. Spring snow melt also presents a greater risk of surface water contamination because the soil is still frozen, limiting water infiltration.

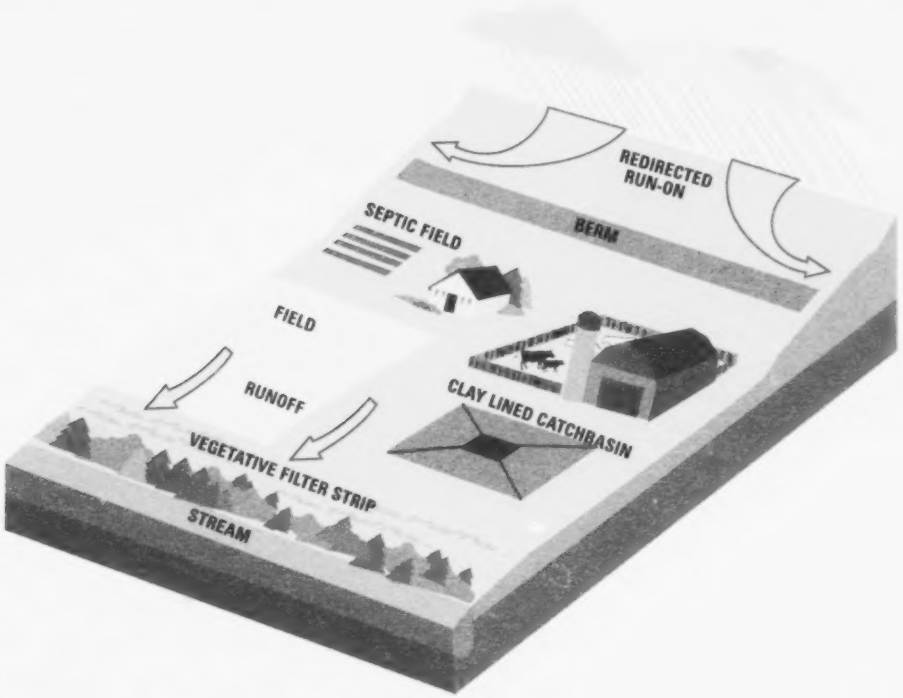
Areas with no plant cover or very little plant residue are susceptible to water erosion. Thin plant stands provide the soil with little protection from rainfall or surface runoff. The type of vegetation also influences the amount of erosion as dense, sod-forming plants provide more protection than do bunch-type plants or those in rows.

Understanding these characteristics and managing water pathways properly may help to reduce environmental risks associated with water movement on the farmstead.

7.2 Managing Water Pathways

Water pathways can be managed by reducing the volume of water, eliminating or minimizing potential hazards and controlling the movement of surface water within the farmstead (see Figure 7.1).

FIGURE 7.1 MANAGING SURFACE WATER PATHWAYS



Follow these general guidelines to manage your water pathways:

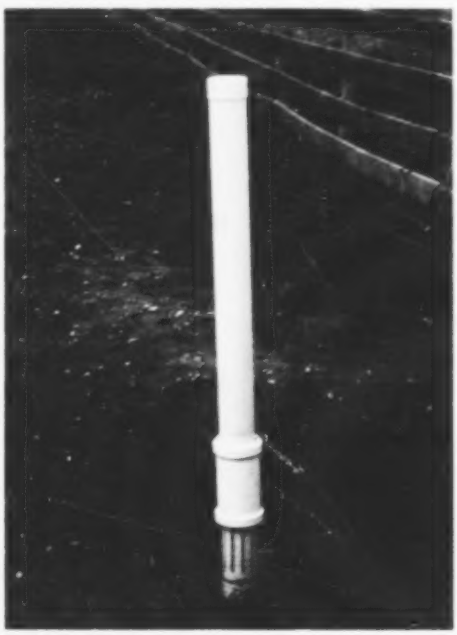
- Locate the farm site on higher ground than that which surrounds it to avoid or prevent potential run-on from flowing onto the farmstead.
- Locate potential hazards such as manure storage areas away from water flow pathways and potential flood zones on the farm site, or protect storage sites so that contact with surface water is minimized or eliminated.
- Divert run-on waters around the farmstead using natural topography or man-made structures such as ditches, dykes, berms or pipes to avoid water contact with manure, sewage or other potential farm hazards to minimize water contamination. Keep in mind that large-scale diversions are regulated by the Alberta *Water Act*, and these diversions may change water supplies and soil salinity patterns:
  - Reduce the amount of run-on from flowing through yards.
  - Modify pathways to reduce the impact that surface water runoff may have for your particular situation. For example, designing and planting a vegetative filter strip in the pathway can slow down water movement and settle out suspended solids. Another option to consider is a **constructed wetland**. Constructed wetlands will slow down water movement and contain it for a period of time, allowing biological activity to help reduce nutrient levels.
- Reduce water usage by fixing leaks and using water restrictors when appropriate to conserve water and reduce the volume of runoff.

- Collect and store rainwater from roofs to water lawns and gardens or to wash objects on the farm site. Collected rainwater can be made clean enough for these uses by simply settling particles, separating solids, aerating or any combination of these.
- Contain and treat runoff that has come into contact with hazards:
  - Collect water that contains excess nutrients in a catch basin and use as fertilizer in the field.
  - Plant vegetative strips near riparian areas or ditches to settle sediments, filter, dilute and absorb nutrients.
  - Collect, contain and properly dispose of water that has pesticides, petroleum or other non-biodegradable hazards appropriately.

7.2.1 Manure Storage and Composting Operations

Water that has come in contact with manure or compost can absorb nutrients (of particular concern are phosphorus and nitrogen) as well as pathogens. These substances can contaminate clean surface water or groundwater supplies.

The *Agricultural Operation Practices Act* (AOPA) includes standards for the siting and construction of solid and liquid manure storages as well as compost storage areas to protect water quality. Surface water control systems are constructed to prevent runoff from leaving these storage areas. For more information, refer to the AOPA *Standards and Administration Regulation* listed at the end of this chapter.



A clean water inlet pipe collects clean run-on water upslope of a livestock yard and discharges it below the yard through a drain outlet
— Courtesy of AAFRD

7.2.2 Animal Facilities

Planning the livestock yard to minimize the amount of run-on (using topography, roofs, gutters, trenches or water diversions) will keep the yard drier and reduce the runoff produced. Siting of short term and long term animal facilities is regulated in AOPA. The livestock yard should be sloped for drainage, and runoff should be diverted to a collection area to be stored. A two-stage collection system works well, with the first shallow basin being used to settle out solids, with the runoff continuing on to a deeper holding basin. This runoff, along with the solids taken from the shallow settling basin, can be spread on fields as fertilizer since it is full of nutrients. It may also contain pathogens of which some are killed with time by sunlight or soil bacteria. An alternative would be to use vegetative filter strips or constructed wetlands to settle sediments and reduce nutrient losses into nearby water resources.

Eroded waterway

Construction of grassed waterway

New grassed waterway

Constructing grassed waterways or vegetative strips can help control water erosion and treat water
— Courtesy of AAFRD

7.2.3 Disposal Sites for Mortalities

Be aware of the risks involved in handling dead animals and the runoff coming from burial or compost sites as it may contain pathogens as well as nutrients. The runoff should be stored and used as fertilizer on fields where there will be no contact with animals.

Proper disposal of dead animals is important to control disease transfer and to limit scavenging by wildlife as outlined in the *Livestock Diseases Act*. Arrange for pickup by a rendering plant, burn in an approved incinerator or compost or bury mortalities as outlined in the *Destruction and Disposal of Dead Animal Regulation*. For more information, refer to Section 8.5 of Chapter 8.

7.2.4 Silage Storage

Silage leachate or runoff contains many nutrients. When large quantities are released into water bodies or soil, oxygen can be depleted, killing bacteria, fish or plants. Silage leachate is also acidic and may corrode metals or concrete, or dissolve soil minerals such as iron and manganese into soil water, which can then enter groundwater. Surface water and groundwater may also receive unwanted organisms such as moulds or bacteria which can produce deadly toxins if the plant material is not at optimum moisture conditions for producing silage.

Depending on silage moisture levels, leachate may occur from the storage area or from runoff due to precipitation. If the silage cover is in good condition, precipitation should not be contaminated and can simply be directed away from the silage storage area.

If leachate does occur, it should be collected in a non-metallic, vented storage area. Deadly gases such as hydrogen sulfide can form if the leachate mixes with manure on-site. Treat the leachate using aeration, dilution or neutralization methods or use as a fertilizer in the field. When fertilizing fields with silage leachate, use amounts that will not burn crops, deplete soil oxygen levels or migrate into watercourses. Another option is to use silage leachate as added moisture when making compost. Aerobic composting bacteria use the nutrients in the leachate and the pH is returned to non-acidic values.

7.2.5 Diposal Field Systems

Both run-on and runoff should be considered when operating or locating septic systems such as disposal fields or open discharge systems. These systems rely on aerobic (oxygen-using) bacteria in the soil to filter nutrients, so they do not leach into groundwater. If the field becomes waterlogged from excessive run-on or use, then the bacteria cannot get enough oxygen. When this occurs, nutrient levels may increase and reach groundwater or surface water. The bacteria may also end up in the groundwater or clog soil pores. Overloading a septic field also creates risks associated with increased runoff. For more information, refer to Chapter 9.

The pathways to and from the septic systems should be studied carefully; keeping in mind that rainwater from roofs, patios and driveways should not discharge into the same area. Any runoff that has been in contact with the area should be collected and used as fertilizer.

EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

7.3 Legislation

Producers should be aware of the following pieces of legislation that pertain to managing surface water. For more information on the legislation, refer to Chapter 12 of this manual.

Federal Legislation

Fisheries Act

Provincial Legislation

Environmental Protection and Enhancement Act

Waste Control Regulation

Agricultural Operation Practices Act (AOPA)

Standards and Administration Regulation

Safety Codes Act

Private Sewage Disposal Systems Regulation

Alberta Private Sewage Systems Standard of Practice 1999

Water Act

Water (Ministerial) Regulation

Livestock Diseases Act

Destruction and Disposal of Dead Animals Regulation

7.4 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development (AAFRD)

Publications: 1-800-292-5697

- Agricultural Operation Practices Act (AOPA) – 2004 Reference Guide Agdex 096-1
- Cattle Wintering Sites Agdex 420/580-2
- Emergency Measures for Control of Wind Erosion Agdex 572-1
- Getting to Know Your Local Watershed Agdex 576-8
- Grassed Waterway Construction Adex 573-6
- Introduction to Water Erosion Control Agdex 572-3
- Introduction to Wind Erosion Control Agdex 572-2
- The Standard – Environmental Standards for Alberta's Livestock Industry Fact Sheets
- Quality Farm Dugouts Agdex 716 (B01)
- Water Quality Fact Sheets

Neil Crawford Alberta Government Library: 780-422-7689

- Beef Herd Management Reference Binder and Study Guide 807-1 (book loan)
- Keep a Clean Image: Livestock and Water (video loan)
- Manure and Riparian Management in the 21st Century (video loan)

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Environment

Publications: 780-427-2700

- Focus on Water Conservation
- Water Act Fact Sheets

Groundwater Information Centre: 780-427-2770
Website: www.gov.ab.ca/env/

Alberta Municipal Affairs

Safety Services: 1-866- 421-6929

- Alberta Private Sewage Systems Standards of Practice Handbook

Website: www.municipalaffairs.gov.ab.ca

Agriculture and Agri-Food Canada

Publications: 613-759-6610

- The Health of Our Water

Website: www.agr.gc.ca

Agriculture and Agri-Food Canada – Prairie Farm Rehabilitation Administration

Publications: Contact your regional office

- Protecting Your Shorelands for Better Farming and Ranching, and Healthier Fish Habitat
- Water Quality Matters Fact Sheets

Website: www.agr.gc.ca/pfra

Alberta Cattle Feeders' Association

Publications: 403-250-2509

- Alberta Feedlot Management Guide

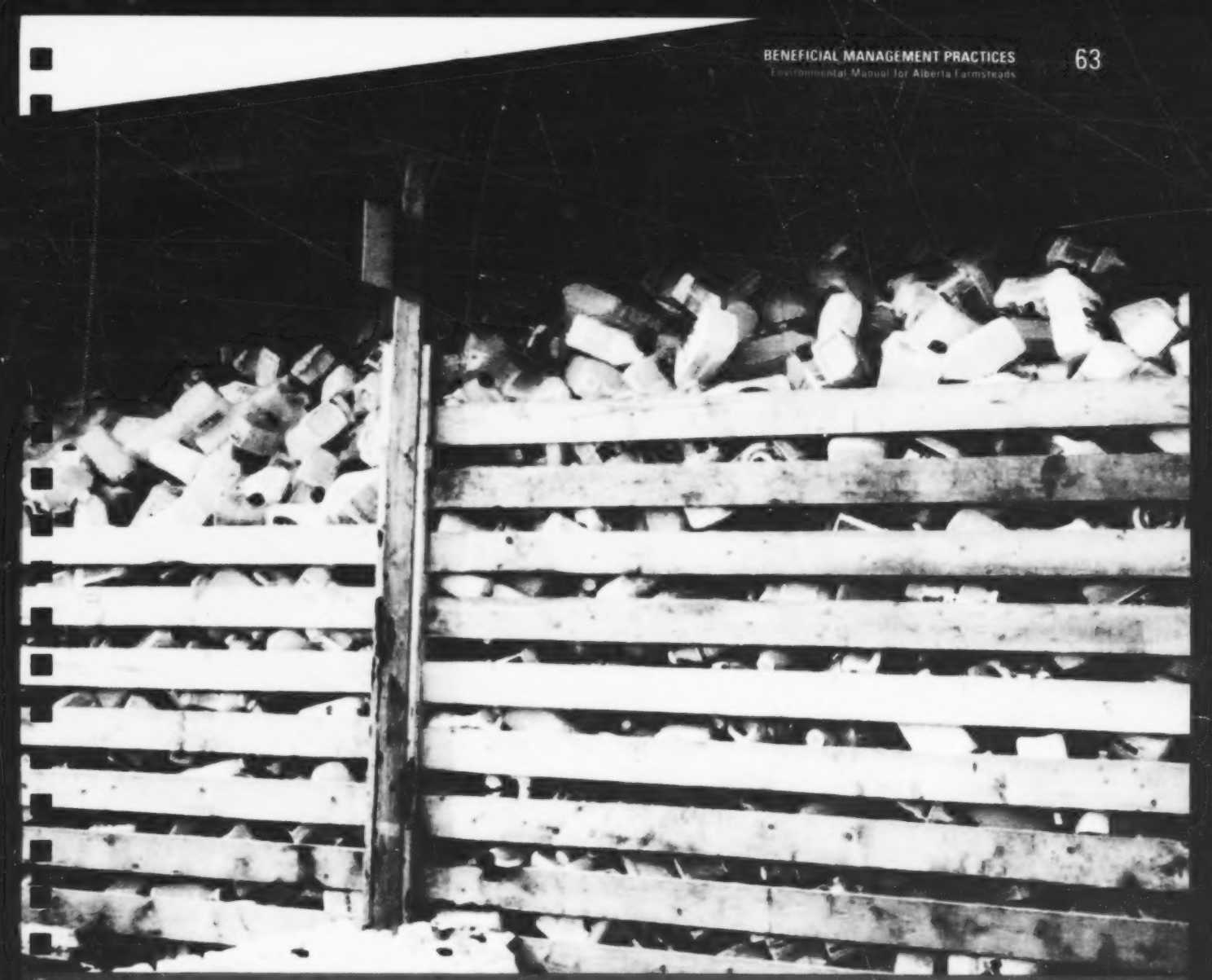
Website: www.cattlefeeder.ab.ca

Cows and Fish - Alberta Riparian Habitat Management Society

Publications: 403-381-5538

- Along the Water's Edge (video)
- Caring For The Green Zone: Riparian Areas and Grazing Management
- Cows and Fish Fact Sheets
- Riparian Areas: A User's Guide to Health
- Riparian Health Assessment for Lakes, Sloughs and Wetlands Field Workbook
- Riparian Health Assessment for Streams and Small Rivers Field Workbook

Website: www.cowsandfish.org/index.html



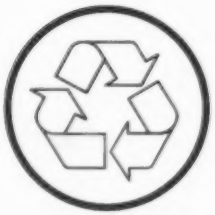
CHAPTER 8.0

Farmstead Waste Management

This chapter discusses beneficial management practices that address waste management on the farm.

Farm waste items pose an environmental risk if they are not stored or disposed of properly.

The best strategy for managing waste on a farmstead starts by:



- Reducing the amount of waste created. This is the best waste management option.
- Reusing items for the same or different purposes.
- Recycling, composting and recovering energy as alternatives to waste disposal.
- Disposing of items only when other options are not possible.

Finding out what services are available in your community is your first step to waste management. Waste programs vary across Alberta, with municipalities developing management strategies that work best for their particular circumstance and location. The Government of Alberta is responsible for provincial waste standards and guidelines, but Alberta's municipalities manage "on-the-ground" operations of municipal and regional landfills, as well as community waste diversion efforts. Many local community groups and non-government organizations devote a tremendous amount of time to promoting waste reduction and recycling programs.

The following table (Table 8.1) outlines options for managing different farm wastes. To ensure facilities will accept your waste, take the necessary steps or precautions prior to delivery. For more details on how to manage your wastes, contact the organizations listed in For More Information at the end of this chapter.

TABLE 8.1 TIPS ON HOW TO MANAGE FARM WASTES

ITEM	ON-SITE STORAGE OR TREATMENT	REDUCE	REUSE	RECYCLE OR RECOVER	DISPOSAL
Refrigerators or freezers	Get refrigerant removed by certified technician		Use as pesticide or animal health care product storage (where no refrigeration required)	Scrap dealer	Licensed landfill (Some sites will remove refrigerant for a fee)
Electronic wastes				Recycling depot (a fee may apply)	
Cardboard and plastic packaging	Keep clean and dry	Purchase products in bulk		Recycling depot	Licensed landfill
Petroleum product packaging	Empty and dry				Licensed landfill
Inert materials (brick, concrete, metal and wood building materials)	Store in secure area		Reuse on farm	Recycle dealers	Licensed landfill Only burn wood products with no preservatives (see Section 8.1)

TABLE 8.1 (CONTINUED) **TIPS ON HOW TO MANAGE FARM WASTES**

ITEM	ON-SITE STORAGE OR TREATMENT	REDUCE	REUSE	RECYCLE OR RECOVER	DISPOSAL
Restricted use materials (insulation, treated lumber, asbestos, composite products and lead pipe)	Store in secure area		Reuse except for asbestos	Recycle except for asbestos	Licensed landfill Dispose of asbestos as a hazardous waste
Old vehicles and farm equipment	Remove any fluids (oil, antifreeze, fuel)			Use for parts or take to scrap dealers	
Automotive wastes (lubricants, antifreeze, filters)	Store in secure area, ensure no water can get into fluids and do not mix antifreeze with other automotive wastes			Fuel dealers	Dispose of as a hazardous waste
Batteries	Store in secure area where spills or leaks can be contained			Recyclers (Automotive batteries cannot be transported in bulk)	Battery collection Dispose of as a hazardous waste
Pressurized tanks				Return to supplier	
Tires			Reuse	Tire recycling depot or retailer	Licensed landfill that will accept tires
Used motor oils and filters	Store in secure area		Reuse as a lubricant or as road dust control **(see Section 8.8)**	Oil recycling depot Local fuel retailer	Dispose of as a hazardous waste
Unused pesticides **(see Section 8.6)**				Return unopened and leftover product to dealer	Dispose of as a hazardous waste
Pesticide containers and contaminated packaging **(see Section 8.6)**	Triple-rinse or pressure rinse containers		Do not reuse	Take to pesticide container recycling depot or return to dealers where possible	
Organic wastes (grass clippings, trees, shrubs, and food waste)				Compost	Burn trees and shrubs **(see Section 8.1)**

TABLE 8.1 (CONTINUED): TIPS ON HOW TO MANAGE FARM WASTES

ITEM	ON-SITE STORAGE OR TREATMENT	REDUCE	REUSE	RECYCLE OR RECOVER	DISPOSAL
Treated seed (see Section 8.7)	Secure in a sealed container	Only treat what is needed			Licensed landfill
Mortalities (see Section 8.5)					
Sharps (see Section 8.4)	Secure storage to prevent injury and separate from other wastes				Class II landfill that accepts medical wastes Veterinary clinic that can handle sharps
Glass	Secure storage to prevent injury and separate from other wastes				Licensed landfill
Animal health care products and medical wastes (see Sections 8.3 and 8.4)	Store in original container in secure area		Return unused to retailer		Expired drugs Class II landfill that accepts medical waste Dispose of as a hazardous waste
Household hazardous wastes (see Section 8.2)					Dispose of as a hazardous waste
Paints, adhesives and cleaners	Store in secure area and dry out paint cans		Reuse or share with others in properly labeled containers		Dispose of as a hazardous waste

LICENSED LANDFILL

Waste disposal creates issues involving leachate, methane gas and odour. A **licensed landfill** is a specific place designed to dispose of waste in a safe manner. All licensed landfills in Alberta go through a rigorous engineering site assessment to guard against surface water and groundwater pollution. Licensed sites separate wastes, such as construction materials, paint containers, batteries and household garbage. In general, licensed sites will have approval from Alberta Environment, which also classifies landfills based on the type of waste material collected.

8.1 Burning

Most farmsteads have a burning barrel, but burning waste not only poses a fire hazard, it also releases many chemicals creating environmental risks. Burning barrels do not reach high enough temperatures to destroy complex chemicals and they only tend to smoulder and smoke. These chemicals are released into your backyard and surrounding community. They can be quite toxic to animals and humans potentially contaminating food processed from animals that consumed residue-contaminated feed.

To reduce environmental and health risks associated with burning waste, only burn items listed under the Substance Release Regulation of the *Environmental Protection and Enhancement Act*, as "burnable debris," which includes:

- brush and fallen trees
- used power and telephone poles that do not contain preservatives
- wood or wood products not containing preservatives
- solid waste from post and pole operations that do not contain wood preservatives
- solid waste from tree harvesting
- straw, stubble, grass, weeds, leaves and tree prunings

A typical farmstead burning barrel for burnable wastes only — *Courtesy of AAFRD*

Under the same Regulation, "prohibited debris," which cannot be burned without a special permit, includes:

- animal manure
- wood or wood products containing wood preservatives
- waste materials from construction sites
- rubber, including tires
- plastics, including baler twine
- oil, pesticides or any other chemical containers
- plastic or rubber-coated materials, including copper wire
- any waste that causes dense smoke, offensive odours or releases toxic substances

If using a burning barrel, ensure to use proper ventilation and screens, locate far enough away from combustible materials and never leave it unattended during use. Remember, there are other alternatives to burning waste: reduce, reuse, recycle, recover and finally proper disposal.

8.2 Household Hazardous Waste

Household hazardous waste refers to materials used in daily activities that are potentially damaging to our environment, health and safety. Typical household hazardous wastes are materials leftover from activities such as painting, cleaning, disinfecting and gardening.

Communities throughout Alberta participate in annual one-day hazardous waste roundups and/or offer year-round collection facilities. Municipalities organize the roundups and pay for collection of the material. Alberta Environment provides funds for the transportation, treatment and disposal of collected material at the Swan Hills Treatment Centre.

To view a schedule for roundup days or permanent collection facilities, contact Alberta Environment or visit their household hazardous waste website at www.gov.ab.ca/env/waste/aow/hhw.

HAZARDOUS WASTE DISPOSAL

Hazardous wastes can be solids, liquids or gases held in containers that may be flammable, corrosive, explosive or toxic. Because of these dangerous characteristics, these wastes should not be disposed of in landfills or sewage systems.

Products that have potentially hazardous characteristics display at least one of the following warning symbols:

Flammable - burn easily like paints, degreasers and other solvents.

Corrosive - eat away surfaces and skin. Familiar examples are waste acids, rust removers, alkaline cleaning fluids and old battery acid.

Reactive/Explosive - react violently when mixed with other chemicals or that react under pressure or heat such as aerosols.

Toxic/Poison - poison or cause damage to living organisms. Materials containing heavy metals like mercury, lead or cadmium.

When a product displays one or more warning symbols, it should be disposed of as a hazardous waste.

For more information on disposing hazardous wastes, call Alberta Environment's Action-on-Waste Recycle Information Line at 1-800-463-6326.

8.3 Medical Wastes

Medicines may need to be disposed of for various reasons including expiry, spoilage or simply because they are no longer needed. There are two classes of expired medicines: unopened and opened. Unused expired drugs can be returned to where they were purchased. Many manufacturers will take them back for disposal.

Expired drugs can be discarded in the same ways as sharps. Modified live virus vaccines should be rendered non-infectious before disposal to prevent the virus from potentially infecting workers or animals. Freezing or adding bleach to the bottle can do this. When disposing of expired medicines, do not attempt to empty or wash bottles - discard them with their contents. Consult a local pharmacist to learn more about medicine disposal.

8.4 Animal Health Care Products

Any leftover or re-useable animal health care products should be returned to the place of purchase or stored in the original container in a secure storage area. Often, these products have recommendations for disposal printed on their labels.

Items that are not usable or have expired beyond the best-before date can be returned to the place of purchase or taken to a hazardous waste depot for proper disposal.

8.4.1 Disposing of Veterinary Waste

Sharps are veterinary and laboratory materials capable of causing cuts or punctures. Sharps include needles, syringes, scalpel blades, slides, coverslips, pipettes, broken glass and empty or expired pharmaceutical containers. There are risks of needle stick injuries or cuts when these materials are not handled or disposed of properly. Certain drugs or vaccines may cause reactions or infections if they are present on broken glass or used needles that break the skin. Blood on used needles, collection tubes or other equipment may contain viruses or bacteria that can cause illness following a cut or needle stick injury. Currently, no regulations cover the disposal of sharps in agriculture.

To safely dispose of sharps:

- Separate sharps from other waste.
- Use a labelled, puncture-proof container with a sealed lid for needles and surgical blades. Special containers can be obtained from many local veterinary clinics.
- Containers must be labelled clearly as containing sharps and must not be used for recycling.
- Do not use containers that allow easy access to the contents. Ensure children or animals cannot remove the lid. A plastic jug with a narrow mouth or a pail with a narrow opening in the lid also works well.
- Use another pail or rigid container for pharmaceutical bottles and syringes.
- Do not burn disposal containers. Use disposal facilities that are set up to accept the waste. This may include a local vet clinic, hospital or waste disposal company. Contact a local vet clinic or hospital for information. Labelled sealed containers can also be taken to Class II landfills that accept medical waste.

OTHER ANIMAL HEALTH CARE PRODUCTS:

Items including antibiotics, parasite treatments, vaccines, implants and banned drug products need to be disposed of immediately after use. In addition to returning those products back to the place of purchase, you can take them to a hazardous waste facility to be disposed of properly. Regularly consult your supplier or veterinarian about products that may have been banned.

8.5 Livestock, Poultry and Farm Animal Mortalities

Livestock and animal deaths may occur no matter how well an operation is managed. Disposing of dead animals quickly and effectively is important to reduce the risk and spread of disease. Carcasses can be a source of disease if scavenged by wildlife or pets. Some of these diseases can then be passed back to livestock or even humans. Carcasses are also unsightly, odourous and a breeding site for flies.

The choices for disposal under Alberta Agriculture's *Livestock Diseases Act - Destruction and Disposal of Dead Animal Regulation* are:

- burial
- incineration
- composting
- rendering
- natural disposal (except for animals that have been euthanized with drugs and chemicals or if the animal is known or suspected to have died from an infectious or reportable disease)

The dead animal should be disposed of within 48 hours of death. However, the dead animal may be stored for more than 48 hours if stored:

- less than a week in an enclosed structure with impervious walls and floors that have been constructed for the storage of dead animals
- outside during winter when the temperature is low enough to keep the dead animal completely frozen
- in a freezer
- in accordance with the directions of an inspector appointed under the *Health of Animals Act* or under the *Livestock Diseases Act*

8.5.1 Burial

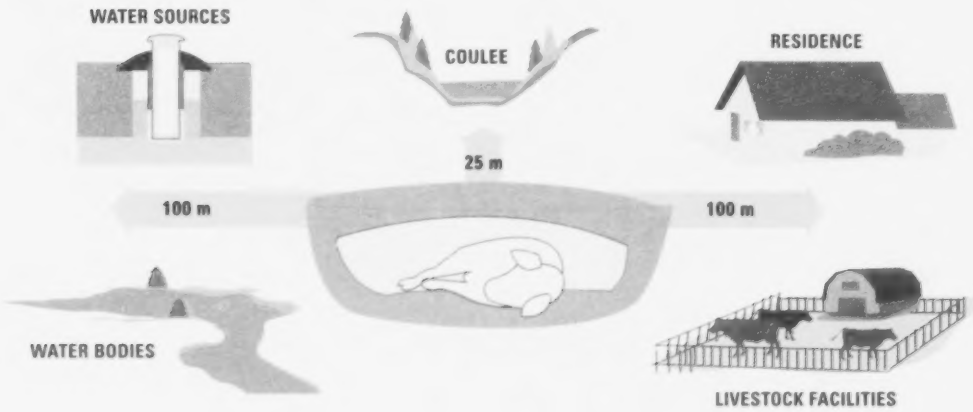
If carcasses are to be buried, do it promptly to control odour, insects and scavenging. Screen the burial pit area from view with trees, shrubs or fences, and locate it some distance away from livestock and other farm areas (see Figure 8.1). For more information, refer to Alberta Agriculture, Food and Rural Development's Livestock Mortality Burial Techniques document (Agdex 400/29-2).

Destruction and Disposal of Dead Animals Regulations contain the following guidelines for burial:

- The total weight of carcasses in a burial pit must not exceed 2,500 kilograms (5,500 lb).
- The pit must be:
  - 100 m (328 ft) from wells, waterways and high watermarks of lakes
  - 25 m (82 ft) from the edge of a coulee, major cut or embankment
  - 100 m (328 ft) from any livestock facility, including pastures that are not owned or leased by the owner of the animal
  - 100 m (328 ft) from a residence
  - 300 m (984 ft) from a primary highway
  - 100 m (328 ft) from a secondary highway
  - 50 m (164 ft) from any other road

- Apply quicklime to the carcass in sufficient quantities to control flies and odour.
- The pit must be covered with:
  - minimum of 1 m (3 ft) of compacted soil
  - wooden or metal lid that is designed to exclude scavengers
- The bottom of the pit must be at least 1 m (3 ft) above the seasonal high water table.

FIGURE 8.1 MINIMUM DISTANCE SEPARATIONS FOR BURIAL PITS



8.5.2 Incineration

The *Destruction and Disposal of Dead Animal Regulation* state that dead animals may be disposed of by incineration on your property. However, this practice must follow the *Substance Release Regulation* or the Code of Practice for Small Incinerators available from Alberta Environment.

8.5.3 Composting

Composting carcasses is an effective way of disposal and can be done in a bin system designed for composting, in a windrow system or open compost pile. Examples of bin designs are available in Alberta Agriculture, Food and Rural Development's Swine and Poultry Mortality Composting documents (Agdex 440/29-1 and Agdex 450/29-1).

A windrow or open compost pile must be:

- 100 m (328 ft) from wells or other domestic water intakes, streams, creeks, ponds, springs, and lake high watermarks
- 25 m (82 ft) from the edge of a coulee, major cut or embankment
- 100 m (328 ft) from any residence
- 100 m (328 ft) from any livestock facility or pasture owned or leased by another person
- designed in a manner that will exclude scavengers

Within these structures:

- each animal or part of it must not exceed 100 kg (220 lbs)
- maximum volume of the animals must not exceed 25 percent of the total compost pile
- animals must be covered by at least 15 cm (6 in) of composting material

8.5.4 Rendering

Dead animals must be picked up by rendering plants within 48 hours of death; until then, the carcass must be stored. When storing carcasses:

- locate the storage area close to the entrance of the farm to minimize the need for collection vehicles to enter the property
- use an area that will minimize the spread of disease — for example, do not store the carcass near a waterway or water body or where it will be easily scavenged
- if not picked up within 48 hours, use special storage bins or refrigeration until the carcass is taken to a rendering facility

8.5.5 Natural Disposal

Natural disposal refers to disposal by scavenging and sites must be located well away from farm areas, water bodies and sources (see Figure 8.2). However, if the animal is known or suspected to have died from a reportable or an infectious disease that can be spread by scavengers or insects, it is best to dispose of these animals under the direction of a veterinarian. Also, natural disposal is not allowed under the *Livestock Diseases Act* if the animal is euthanized.

Here are the following guidelines for natural disposal under the *Destruction and Disposal of Dead Animals Regulation*:

- The animal is disposed of on property owned or leased by the owner of the animal.
- The total weight of the carcasses disposed of at any one site must not exceed 1,000 kilograms (2,200 lbs).
- There must be at least 500 m (1640 ft) between disposal sites.
- The site must be:
  - 500 m (1,640 ft) from wells, waterways and lake high watermarks
  - 25 m (82 ft) from the edge of a coulee, major cut or embankment
  - 400 m (1,312 ft) from any livestock facility, including pastures that are not owned or leased by the owner of the animal
  - 400 m (1,312 ft) from a residence
  - 400 m (1,312 ft) from a road allowance
  - 400 m (1,312 ft) from a provincial park, recreation area, natural area, ecological reserve, wilderness area or forest recreation area
- The site must not create a nuisance.

FIGURE 8.2 MINIMUM DISTANCE SEPARATIONS FOR NATURAL DISPOSAL

8.6 Pesticides

8.6.1 Proper Pesticide Disposal

Pesticides that are no longer usable are considered hazardous wastes and cannot be disposed of in approved Class II landfills or by burning.

To use up and dispose of excess or unwanted pesticides:

- Return unopened or non-compromised product to the dealer for a refund.
- Offer opened and unused leftover pesticide supplies, in original containers with product labels attached, to other potential users (such as neighbours or the municipality) for use according to label directions.
- Consider using up smaller quantities for weed control, according to label directions, along fence lines and other areas difficult to access with large spray equipment.
- Contact the nearest hazardous waste depot for disposal.

8.6.2 Pesticide Container Disposal

Unrinsed containers have the potential to contaminate soil, groundwater and surface water, which can be toxic to fish and wildlife, as well as fill valuable space in landfills. Also, these containers impede the processing and recycling of other empty pesticide containers, as they have to be emptied, exposing workers to the residue. Residues can be transported into the atmosphere during storage, processing, shipping and energy recovery, or they can contaminate end products from plastic recycling processes. In addition, it is estimated that 6 to 7 percent of product can be left in unrinsed containers. This amount of material can treat ½ to 1 acre of land and can save you several dollars.

Pesticide containers must be manually triple-rinsed or **pressure rinsed** and dried before disposal at a pesticide container site. Currently, most producers use triple-rinsing, and in most cases, this practice leaves plastic, metal or glass pesticide containers more than 99 percent free (less than 1 ppm) of residues.

Follow these steps for manual triple-rinsing your containers:

1. Empty container contents into sprayer tank and drain in a vertical position for 30 seconds.
2. Add water to container to about 1/5 full.
3. Shake container thoroughly, empty into sprayer tank and drain for 30 seconds.
4. Repeat procedure two more times (it should only take about 5 minutes in total).
5. Puncture or break open triple-rinsed container so it cannot be reused. Note: Do not puncture unrinsed containers as pesticide from unrinsed containers is concentrated and will leak, exposing persons handling the containers and the environment to the concentrated pesticide.
6. Dispose of all plastic and metal containers at a pesticide container collection site.

Instead of using the triple-rinse procedure, producers can eliminate steps with a pressure jug rinser. Pressure rinsers direct water from a pressurized source against the inner sides of the container, which effectively washes the pesticide residue into the spray tank. Pressure rinsers also have the added advantage of rendering containers useless by automatically puncturing them. This method reduces environmental risks by ensuring jugs are rinsed automatically and reduces the risk to the producer by eliminating handling of pesticide containers.

Empty pesticide containers must be disposed of properly and in accordance with provincial regulations. Under Alberta's *Environmental Protection and Enhancement Act*, non-refillable plastic or metal pesticide containers (restricted, commercial, agricultural and industrial products) must be disposed

of at a pesticide container collection site. A list of pesticide container disposal sites in Alberta and operation hours are available from municipalities, the AAFRD Crop Protection Manual, (Agdex 606-1) or Alberta Environment.

Paper and cardboard pesticide packaging that have not been contaminated with pesticides can be directed to a recycling centre. Any cardboard contaminated due to a container rupture, accidental spill or improper handling procedure should be disposed of as a hazardous waste. Evidence of cardboard contamination should be obvious – signs of exposure to liquid, powder or granules, or a strong chemical odour. Do not burn paper bags or cardboard containers. Some pesticide container sites have bins or separate areas for collecting these outer packaging materials. Containers from topical parasiticides (e.g. pour-on compounds or powders for lice and mange) should be returned to dealers for collection and disposed through programs operated by manufacturers.

8.7 Treated Seed

Practices to properly store and dispose of treated seed include the following:

- If you are treating bulk seed on the farm, treat only as much as you need for immediate use.
- For temporary storage on the farm, place the seed in a secure, sealed container.
- If you have leftover treated seed that cannot be returned to a dealer, plant the seed at a rate not exceeding three times the normal seeding rate, or contact a regional sanitary landfill for authorization to bring the seed to the landfill for immediate burial.

8.8 Used Oil for Road Surfaces

Used oil can be recycled or used to control dust, but only in accordance with Alberta Environment's Guidelines for the Application of Used Oil to Road Surfaces.

These guidelines allow used oil to be applied for dust control under the following conditions:

- The applicator must have permission from the land owner or municipality responsible for the road.
- The oil must meet certain specifications for maximum contents of things like arsenic, cadmium, lead, etc. (These components are listed in the guidelines, but fortunately most waste oil from typical diesel or gasoline engines contains less than these limits, so farmers are not obligated to send their oil in for testing).
- The application of the oil must be more than 25 m from surface water (including sloughs) or a domestic water supply.
- The application rate cannot result in visible runoff of oil beyond the traveled portion of the road.
- Application of oil is limited to two times per year.

EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

8.9 Legislation

Producers should be aware of the following pieces of legislation that pertain to wastes and the environmental risks associated with their storage and disposal. For more information on the legislation, refer to Chapter 12 of this manual.

Federal Legislation

Fisheries Act

Health of Animals Act

Provincial Legislation

Environmental Protection and Enhancement Act

Substance Release Regulation

Waste Control Regulation

Livestock Diseases Act

Destruction and Disposal of Dead Animals Regulation

8.10 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697

- Crop Protection – the Bluebook Agdex 606-1
- Home Composting Agdex 537-1
- Livestock Mortality Burial Techniques Agdex 400/29-2
- Livestock Mortality Management Agdex 400/29-1
- Poultry Mortality Composting Agdex 450/29-1
- Swine Mortality Composting Agdex 440/29-1
- Tips and References for Owners of Small Farms and Acreages Agdex 570-8

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Environment

Publications: 780-427-2700

- Alberta's Municipal Waste Action Plan 2004-2006
- Code of Practice for Compost Facilities
- Code of Practice for Small Incinerators
- Saving the World Begins at Home

Action-on-Waste Recycle Information: 1-800-463-6326
Website: www.gov.ab.ca/env

Alberta Plastics Recycling Association

Office: 780-939-2386
Website: www.plasticsrecycling.ab.ca

Alberta Recycling Management Authority

Electronic and Tire Recycling: 1-888-999-8762
Website: www.albertarecycling.ca

Alberta Used Oil Management Association

Recycling Centre Locations: 1-888-922-2298
Website: www.usedoilrecycling.com

Olds College

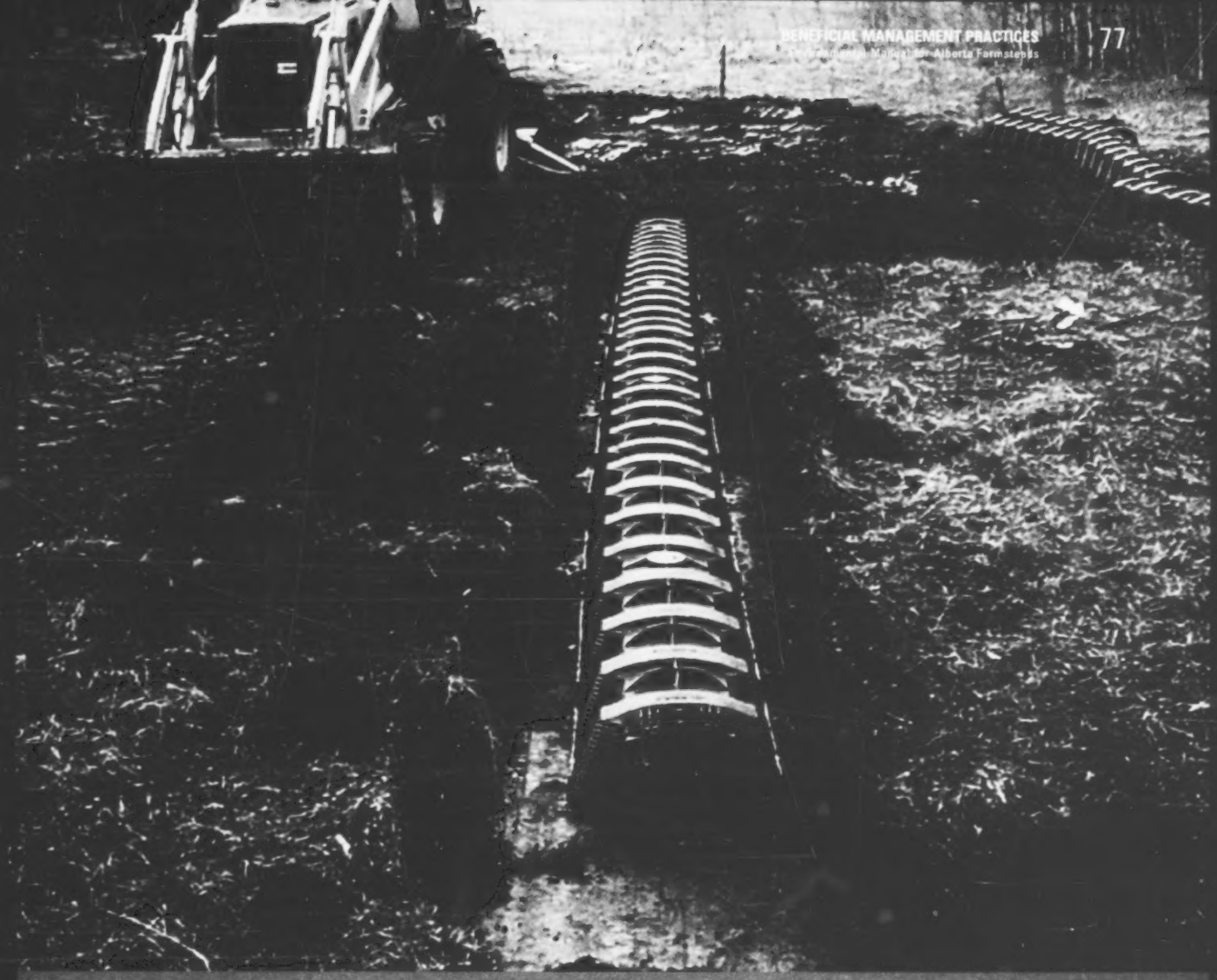
Publications: 403-556-4683

- On-Farm Composting Handbook

Website: www.oldscollege.ab.ca

OCCI Composting Technology Centre

Technical Information: 1-877-815-6224 or 403-507-7970
Website: www.occi.ab.ca



CHAPTER 9.0

Household Wastewater Management

This chapter discusses beneficial management practices that address household wastewater management through proper installation and maintenance of a private sewage system on a farmstead.

Almost all farm homes use private sewage treatment systems, which collect, treat and dispose of treated wastewater from a single source in the same location that it is generated. The most common type of on-site sewage system is a septic system, which includes a holding tank where bacteria decompose waste products into effluent, indigestible solids and gases. The effluent is discharged on-site, while the undigested solids remain in the tank to be pumped out on a regular basis.

These systems are usually economical and reliable, but they must be properly maintained to handle all the wastewater produced. The system must also treat the wastewater to prevent further surface water and groundwater contamination since it may contain bacteria, infectious viruses, household chemicals and excess nutrients such as nitrates and phosphates. Learning more about your present system can help determine if it is treating your household wastewater properly.

9.1 Proper Design and Siting of a Private Sewage Treatment System

To prevent potential contamination on your farmstead, you should ensure that your sewage system is designed and functioning properly so that wastewater is treated effectively. To achieve this goal, there needs to be sufficient wastewater amounts, good wastewater movement and a proper system design. These components also ensure complete distribution and reduce the incidence of freezing within the system. Steps should be taken to prevent oversaturation of disposal field systems.

It is important to look at the farmstead site to determine where potential problems could arise. Unfavourable soil characteristics, high water tables and impervious layers could very well impede a household wastewater system. You need to consider the location of the system as well as the potential wastewater volumes and the strength of sewage being generated to minimize any potential environmental risks.

Septic tank installation — *Courtesy of Safety Services, Alberta Municipal Affairs*

When siting the sewage system on the farmstead, consider the following options:

- direct run-on waters away from the disposal area
- discharge sewage effluent away from a water body or vegetable garden
- ensure distances from buildings, dwellings, property lines, water sources and water bodies follow what is outlined in the *Private Sewage Disposal Systems Regulation* for Alberta

9.2 Types of On-site Private Sewage Systems

The first step to ensuring that your sewage system is working properly is to know what type of system you have.

On-site private sewage systems can include one or a combination of the following:

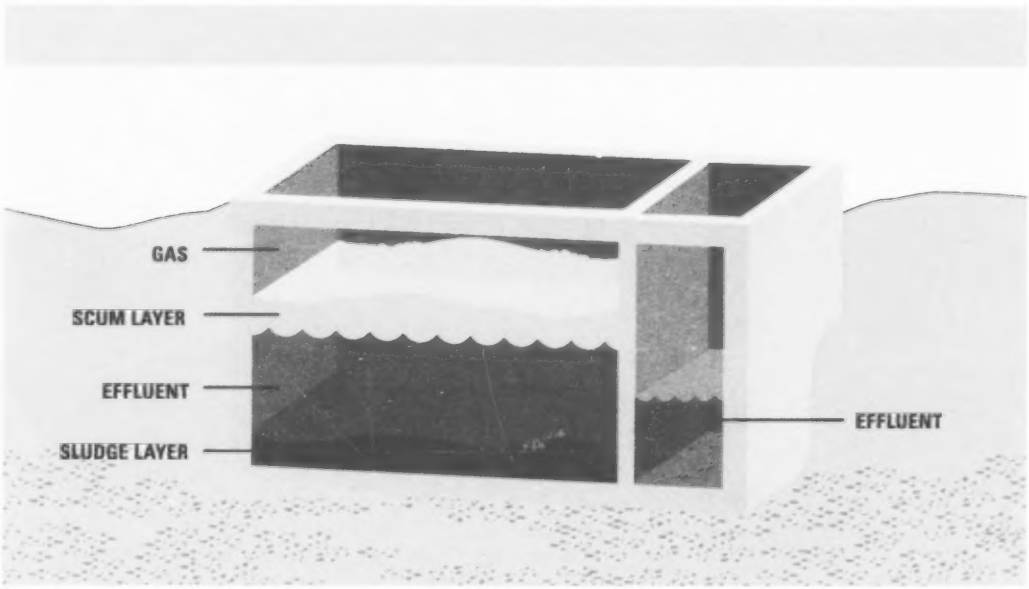
Holding tank

A holding tank is an approved watertight receptacle for the collection and temporary storage of sewage, until it can be pumped out. Mobile equipment is used to empty the tank, and the sewage is disposed of in an acceptable manner.

Septic tank

The septic tank is a digestion chamber comprised of two steps in which sewage is retained and effluent is discharged (see Figure 9.1). The first chamber settles out the solids producing a sludge layer, which is pumped out after a certain time period. The second chamber receives the effluent from the first chamber, which is then stored and intermittently discharged to an effluent treatment and disposal system.

FIGURE 9.1 SEPTIC TANK SYSTEM



Packaged sewage treatment plant

A packaged sewage treatment plant is a high tech septic tank that produces a higher quality effluent than a standard septic tank. Air is stirred or bubbled into the waste to help breakdown the material, resulting in sludge and a reasonably clear effluent. The effluent is discharged to the final treatment component of the disposal system, and the sludge is periodically pumped out.

Sand Filters

Sand filters receive effluent from a septic tank and provide further treatment. This additional treatment is achieved using a pressurized distribution system within the sand filter, which intermittently discharges effluent evenly over the surface of the sand. The sand provides an aerobic environment and contains bacteria that treat the effluent. Once treated, the effluent is then collected and pumped to a final disposal system.

GRAVITY DISTRIBUTION VERSUS PRESSURE DISTRIBUTION OF EFFLUENT

A gravity distribution system may overload and provide soil microbes with more food than they can consume. The soil may also become saturated under a gravity distribution system and is not favourable for aerobic microbes to treat the sewage. Pressure distribution provides a more even dispersion of effluent in a disposal field or mound, resulting in a more effective wastewater treatment and extending the life of the system.

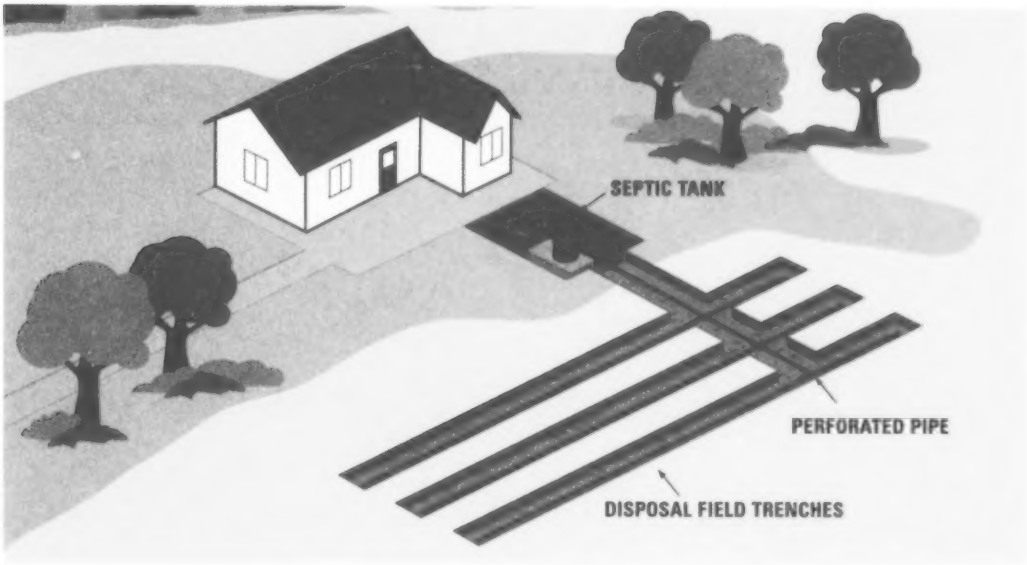
Disposal field

A disposal field system is an effective means of distributing effluent evenly within a soil-covered trench containing void spaces. Microorganisms living in the soil then use oxygen in these voids to breakdown the effluent into safer components.

Types of disposal fields include:

- conventional system that uses perforated piping laid in gravel-bedded trenches and usually sub-surface weeping tiles to help distribute effluent in the soil (see Figure 9.2)
- chamber system that uses perforated structures to provide void spaces for storage and movement of effluent and an interface with the exposed soil surface for infiltration
- gravel substitute that is a conventional disposal field in which gravel is replaced with an alternate media having characteristics that provide void spaces and performance similar to gravel

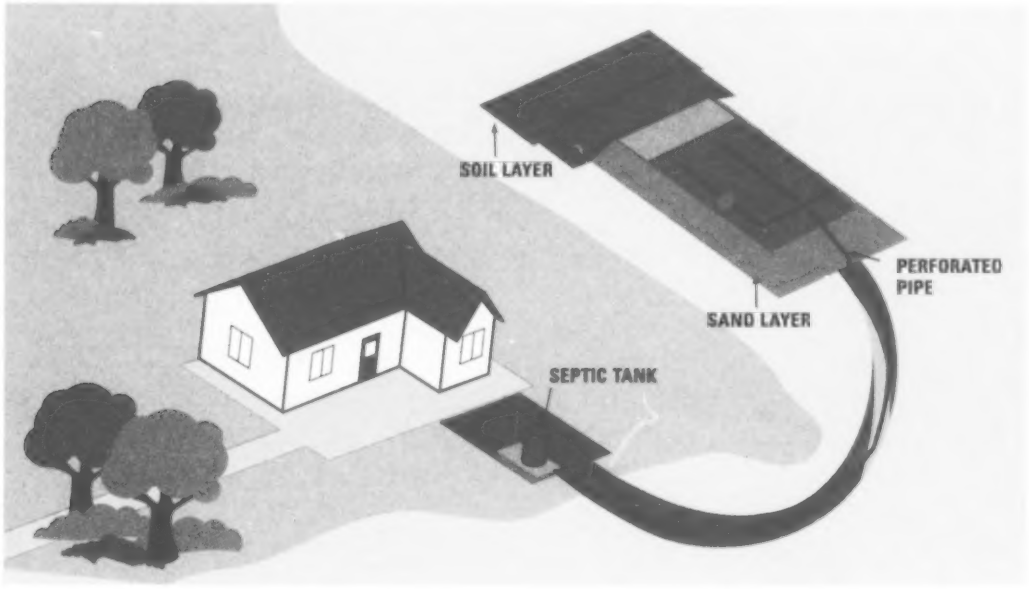
FIGURE 9.2 CONVENTIONAL DISPOSAL FIELD SYSTEM



Treatment mounds

Treatment mounds are built above grade to overcome limits imposed by proximity to water tables, bedrock or by highly permeable or impermeable soils (see Figure 9.3). Effluent pumped to the mound then drains through a layer of sand, in which aerobic bacteria exist to treat the effluent.

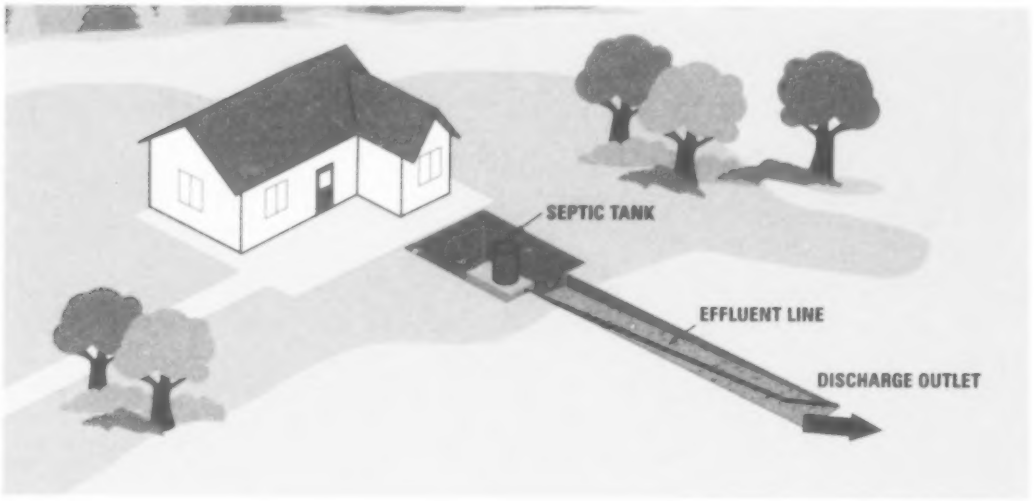
FIGURE 9.3 TREATMENT MOUND SYSTEM



Open discharge systems

An open discharge system discharges effluent on to the ground surface, so the effluent evaporates and absorbs into the soil as a method of treatment (see Figure 9.4). The system must contain the effluent on the property and protect the soil at the outlet from erosion. Alternative designs for open discharge systems exist depending on the slope of the land and size of system components.

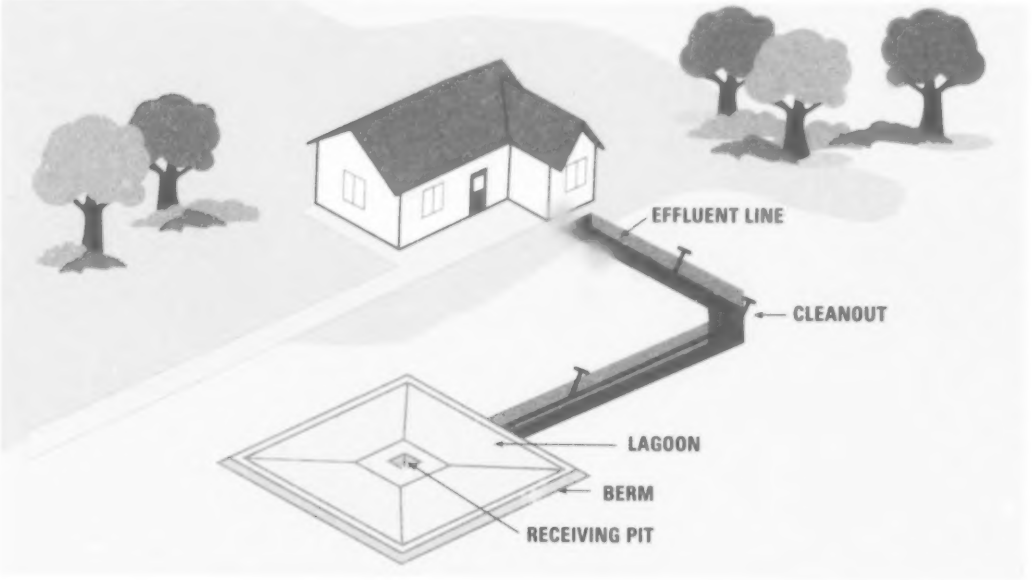
FIGURE 9.4 OPEN DISCHARGE SYSTEM



Sewage lagoon

Sewage lagoons are shallow, artificial ponds that are lined prevent the downward movement of effluent into the soil and groundwater (see Figure 9.5). This sewage system stabilizes effluent overtime by providing an environment that allows for evaporation and breakdown of sewage components by bacteria and algae.

FIGURE 9.5 SEWAGE LAGOON



Cesspools

Cesspools are covered, underground containers or pits for the temporary storage of liquid waste and sewage. They exist on older farm sites, but are not considered acceptable by today's standards. The liquid portion of the sewage is disposed of by seeping or leaching through a perforated liner into the surrounding soil, while the sludge is retained to undergo partial decomposition before occasional removal.

Over time, a bio-mat accumulates on the walls, plugging off its leaching surface making it inoperable. This result could cause a cesspool to overflow, allowing untreated effluent to pose environmental and health safety risks. Where cesspools were excavated to depths that entered water tables, the high water tables would infiltrate into the cesspool, causing them to overflow as well as wash the bio-mat away from its wall surfaces. Then as the water table receded, the poorly treated effluent would migrate into the water table and cause potential contamination to other water sources such as water wells.

The construction of cesspools is no longer permitted.

9.3 Wastewaters and Associated Concerns

Certain wastewaters on a farmstead need to be handled properly. Backwash from iron filters and water softeners, garborator wastes from the kitchen, grease and oils all need special attention.

Backwash water from iron filters

Wastewater from iron filters should not be discharged into the septic system. Iron filters typically discharge a significant volume of water that needs to be accounted for in design, otherwise it may overload the system. Also, the iron removed from the water supply and then discharged with the backwash water can have a negative effect on the capability of the soil to absorb water.

Backwash water from a water softener

Using sodium salts in a water softener may be harmful to a sewage disposal system. Increased sodium levels may reduce the effectiveness of the septic tank by negatively affecting microbial activity. As well, high sodium in the effluent may reduce the ability of the soil to absorb and move the effluent, especially in the presence of clay.

As the wastewater from these systems is not considered contaminated, it can be discharged on top of the ground in a location on the property that the owner considers suitable.

Garborator Wastes

A garbage grinder (commonly known as a garborator) will increase the amount of organic matter in a septic system. This increase in organic matter results in a higher Biological Oxygen Demand (B.O.D.) on the soil treatment system, increasing the risk of system failure. With septic tanks, the grinder adds additional solids that will decrease the capacity of the tank. When garbage grinders are used, it is recommended that the septic tank size and final treatment system be increased.

Grease and oils

Grease and oils are complex molecules that are difficult to breakdown and should not be discharged into a private sewage system because they can cause the system to plug up. To avoid this problem, minimize the use and disposal of grease and oils into the system. Consider scraping off greasy food and wiping dishes with disposable paper towels. If using large quantities, use grease traps and contact an experienced waste disposal and handling company for options.

9.4 Maintaining On-Farm Sewage Systems

Operating a private sewage system on a farmstead requires knowledge and skill. A good sewage system prevents damage to the environment, and it also helps to protect the health of your family and neighbours. Newer technology is allowing for rural sewage systems to provide treatment beyond the capability of older systems, allowing for longer life of the system and reducing any environmental and health safety risks.

The key to operating a good private sewage system depends on which system you choose for the farmstead. Some of the more traditional systems use a septic tank with a disposal field. With this type of system, it is essential that it be maintained.

9.4.1 Septic Tank Maintenance

Solids in the septic chamber of a septic tank are broken down at a slower rate in the anaerobic environment of the tank. These solids, along with greases, soap curds and other material that float on the liquid surface (scum layer), accumulate overtime and reduce the storage capacity of the septic chamber (refer back to Figure 9.1). Solids must then be periodically removed from the chamber and disposed of in another manner to ensure the tank functions properly.

Timely cleaning of a septic tank is important. Solids and other organic material can be carried from the septic chamber into the effluent chamber and discharged into the effluent disposal system. This situation can eventually result in system failure, as additional suspended solids and organic material will plug the system and reduce the infiltration capacity of the soil surface.

The size of the septic chamber determines the intervals between cleaning. The larger the septic chamber, the better the separation of solids from the effluent, especially during peak flows. The septic chamber should be checked each spring or early summer for accumulated sludge and scum. A septic chamber with 45 cm (18 in) of sludge should be cleaned.

Emptying the tank in the spring will allow bacterial action to resume more quickly during the warmer summer months. It is not necessary to thoroughly scrub and flush the septic chamber until it is visibly clean. The small amount of sludge that remains on the floor and walls will serve as microbial inoculants, which will allow normal operation to resume as soon as possible. Vacuum-pumped sewage hauling trucks are available commercially to empty septic tanks. This equipment is capable of doing an excellent job without spillage.

Current disposal options for solid wastewater material or septic tank contents consist of two kinds: land application and wastewater treatment plants. Where hauling distances make the delivery of the wastewater to a treatment plant not feasible, land application is the most economic and viable option. Disposal of private wastewater on agricultural land is an acceptable practice. However, disposing of municipal wastewater is regulated and must follow certain restrictions governed by Alberta Environment. Always keep records indicating where, when and how much wastewater was applied.

Land applications with such wastewater should occur:

- between April and October of each year
- on soil with a pH > 6.5
- on slopes < 5 percent
- on land with depth to water table > 2 m (7 ft)
- when wastewater can be injected or incorporated within 48 hours

Land applications should not occur:

- when application rates exceed 100 m^3/ha
- near water sources and water bodies, dwellings, roads, public buildings, school yards, cemeteries, playgrounds, parks and campgrounds
- on ice, snow-covered or frozen ground
- near or in stream valleys or intermittent drainage areas
- on land being used for root, vegetable or fruit crops or dairy farming pasture

For more information on wastewater land application guidelines, contact Alberta Environment.

9.4.2 Greywater Options

Greywater is wastewater from bathing, washing and laundry, but does not contain toilet wastes, food wastes, dirt or other contaminants (known as blackwater). It can be treated in a private septic system, but is not as high in nutrients or pathogens as typical household wastewater. Bacteria in a septic field do need nutrients to survive, so greywater itself may not provide enough nourishment for them to keep the septic field healthy and active.

There are other disposal options for greywater when it is separated from blackwater due to the low presence of pathogens. Thus, greywater can be used for irrigating, but only on non-food plants since there is a chance of contaminating plants used for food. It can also be discharged below ground in a drip irrigation system where soil bacteria will filter any pathogens and nutrients out of the water. Regardless of the disposal method, separation distances for greywater from property edges, wells, water sources, watercourses and buildings must be met and all runoff should be contained on the property.

EMERGENCY PLAN

Every farmstead needs an emergency plan, which outlines the location of hazardous materials, emergency equipment, telephone numbers and necessary clean-up instructions. The plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protects those living on the site and in the surrounding community. For more information about emergency planning and the steps necessary to minimize environmental risk and ensure the safety of others, refer to the Appendix.

9.5 Legislation

Producers should be aware of the following pieces of legislation that pertain to household wastewater management. For more information on the legislation, refer to Chapter 12 of this manual.

Provincial Legislation

Safety Codes Act

Private Sewage Disposal Systems Regulation

9.6 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Environment

Publications: 780-427-2700

- Guidelines for the Application of Municipal Wastewater Sludges to Agricultural Lands March 2001

Information Centre: 780-427-2700
Website: www.gov.ab.ca/env

Alberta Municipal Affairs

Safety Services: 1-866-421-6929

- Alberta Private Sewage Systems Standard of Practice 1999 Handbook

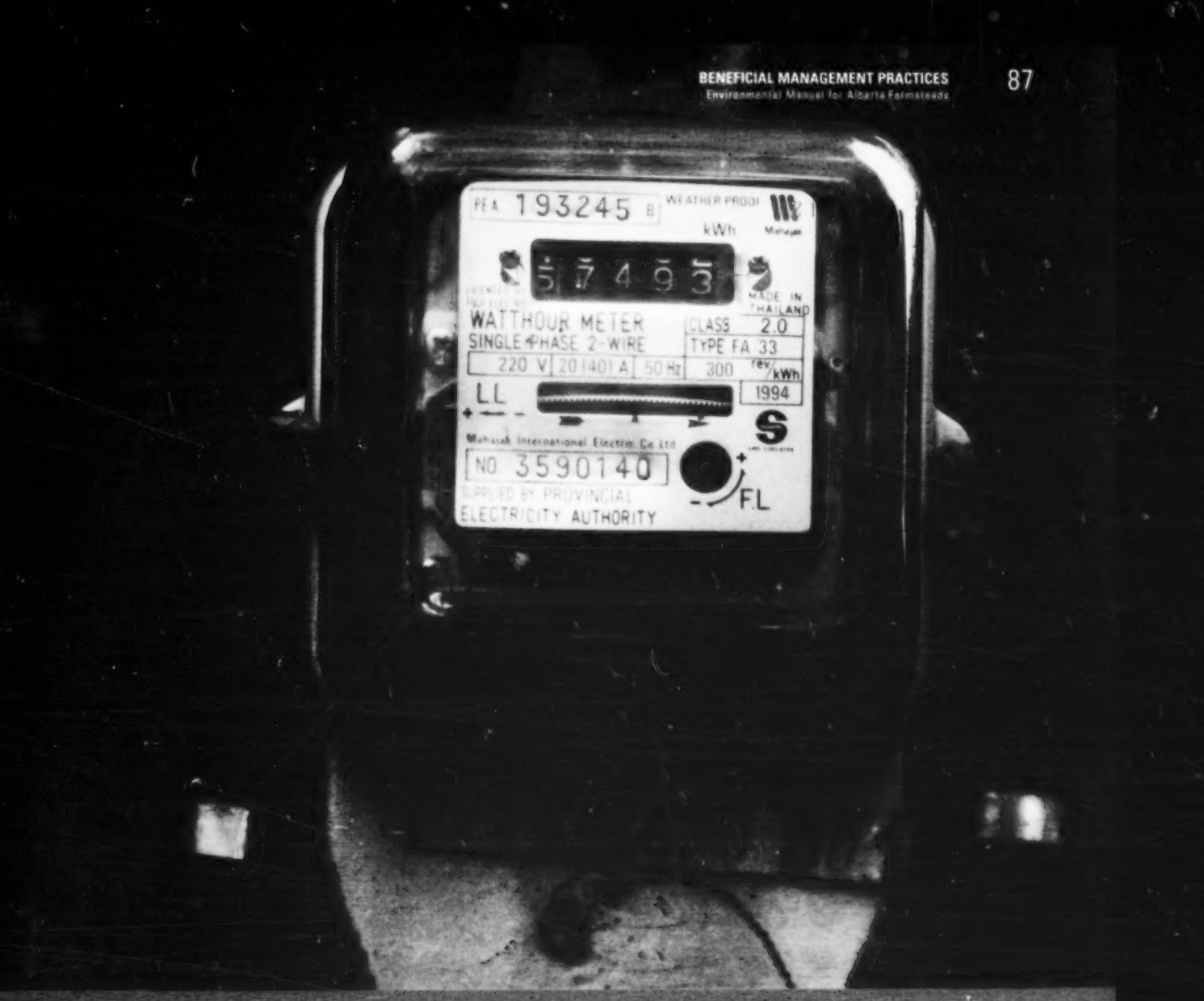
Website: www.municipalaffairs.gov.ab.ca

Alberta Onsite Wastewater Management Association

Publications: 780-489-7471

- Private Onsite Waterwater Treatment System Owners

Website: www.aowma.com



CHAPTER 10.0

Energy Efficiency

This chapter discusses beneficial management practices that address energy efficiency on your farmstead.

Energy costs are a significant part of a farmstead's total operating budget. The burning of fossil fuels contributes to air pollution and greenhouse gas emissions. By improving energy use on your farmstead, you can help minimize or reduce your financial costs and environmental risks.

Before you can make energy efficiency changes on your operation, you need to know how much energy you are actually using. This can be accomplished by completing an energy audit.

10.1 On-Farm Energy Audit

The purpose of an energy audit is to determine what energy costs are associated with your home and farm, including what and where the energy is being used. The first step is to look at the cost and consumption rate of electricity, natural gas, gasoline, diesel and other energy sources, from which a base cost assessment can be developed.

The next step in the audit is finding where the energy is being used. When looking at operation costs and efficiency, it is necessary to conduct on-farm inspections of all buildings, doors, lights, windows, equipment, etc. Insulation levels, the hours lights are on, ventilation settings and age of equipment all need to be taken into consideration when conducting the walk-through. This knowledge will give you a better understanding of energy use and loss on your farm.

Some important questions to ask when looking for energy problems and possible solutions include:

- Have buildings and equipment been regularly maintained?
- Can sealing of windows and doors be improved or should they be replaced?
- Can insulation be added?
- Can operating temperature be reduced?
- Could automated controls help save energy?
- Does equipment need to run as long?
- Can more efficient equipment be installed?

On average, farm costs can be reduced by 10 to 15 percent by practicing proper maintenance and making minor modifications to operation practices. The actual cost savings will depend on how energy efficient the operation was before modifications were implemented.

For more information on conducting energy audits, contact your local energy supplier.

10.2 Field Operations – Tractors and Equipment

For farm equipment and other machinery that is used on your farmstead, regularly scheduled maintenance helps maximize energy efficiency and reduce wear and tear. Selecting the proper machine for the proper task, that is matching implements and tractors so the tractor is operating at its full rate load, helps to prolong engine life and the life of the equipment itself. For example, much of the work performed by a large farm tractor may be "light load work." It is estimated that a farmer with an annual fuel bill of $2,000 could save $400 per year by shifting up and reducing engine speed when doing light work.

Using the gear-speed ratio recommended in the tractor user's manual helps prevent unnecessary repairs. For example, if a load on the tractor reduces the engine speed to less than half of its original setting, cylinder wall scarring may occur due to improper lubrication.

Keep a list of all electric motors in use, and record the preventative maintenance measures performed on each to be sure they are checked, cleaned and lubricated regularly.

Fuel efficiency can be improved with fuel saving measures such as maintaining tires at the lowest correct pressure for the load to be carried, using the right fuel for the season and performing regular maintenance. Poor maintenance schedules can reduce the life of an engine by one-quarter to one-half. A properly maintained engine gets 6,400 hours of operation before an overhaul is needed. The average tractor gets less than 4,000 hours.

10.3 Lighting

The type of lighting you use depends on the application and environment. Consider how much light is needed, duration of lighting, type of environment (indoors, outdoors, temperature, moisture, dirt), paint surfaces, etc. to determine the most efficient lighting for each situation.

General maintenance of light bulbs can be as simple as wiping the dirt off. This small step allows the correct light level to be emitted through without additional lamps being added.

Lights come in various forms, and each type of light has different characteristics (see Table 10.1). Consider your lighting options.

Colour Rendering Index (CRI) is the ability of a light source to represent colour, based on a 0-100 scale. The higher the CRI, the closer to natural light the colours appear.

Watt (W) is the amount of electricity a light bulb uses to produce light and is not an indication of brightness.

Ballasts in fluorescent lights are used to convert line current into the proper form for the light to work. Ballasts can be either electric or magnetic. Magnetic ballasts are the older style and have a buzz noise to them. They are much lighter than electric ballasts, and the bulb lights up almost immediately with no flickering. Electric ballasts are more costly but more energy efficient.

TABLE 10.1 **DIFFERENT TYPES OF LIGHT AND EFFICIENCIES**

LIGHT TYPE	APPEARANCE	APPLICATION	COMPARISON/ EFFICIENCY	COMMENTS
T12 fluorescent	• Tubular • Most common lengths · 1 m (4 ft) and 2 m (8 ft)	• Offices, large interior lighting areas	• Last up to 20 times longer than incandescent • Cooler than halogen and incandescent (save on air conditioning) • More energy efficient than incandescent • Typically: · most 1 m (4 ft) draw 40 W – energy saver T12 draw 32 W (but put out less light) · most 2 m (8 ft) draw 60 to 75 W	• 70 + CRI • Low maintenance costs • The 12 represents the diameter of the tube · 12/8 = 1.5 – 1.5" • Same socket (pins) as T8 • Ballast alters the electric current flowing through the tube (activates the gas, causing it to glow)
Low pressure sodium	• Only emit light in the yellow portion of the visible spectrum	• Outdoor lighting	• Of high pressure and metal halide: · most energy efficient · lowest CRI	• Less popular over the years because more emphasis has been put on CRI ability

TABLE 10.1 (CONTINUED) **DIFFERENT TYPES OF LIGHT AND EFFICIENCIES**

LIGHT TYPE	APPEARANCE	APPLICATION	COMPARISON/ EFFICIENCY	COMMENTS
High pressure sodium	• Orange or amber colour		• Moderate to excellent CRI (though this depends on specific lamp design) • Uses 50% less electricity than mercury vapour	• 22-75 CRI
T8 fluorescent	• Tubular • Most common lengths 1 m (4 ft) and 2 m (8 ft)	• Offices, large interior lighting areas	• Last up to 20 times longer than incandescent • Up to 30% more energy efficient than T12 • Cooler than halogen and incandescent (save on air conditioning) • Typically: - 1 m (4 ft) draw 32 W and produce as much light as a 40 W T12 - 2 m (8 ft draw about 59 W • Better CRI compared to standard fluorescent • Stays brighter over the life of the bulb; therefore, you can get by with fewer lamps	• 70-80+ CRI • The 8 represents the diameter of the tube - 8/8 = 1 — 1" • Same socket (pins) as T12 • Ballast alters the electric current flowing through the tube (activates the gas, causing it to glow) • Eliminates the familiar flicker and hum sound of old fluorescent lights
Metal halide	• Bluish white	• Exterior lighting • Best used in public and commercial parking	• A 32 W can replace an incandescent in the range of 100-150 W - over 50% savings • A 100 W can replace a 175 W mercury vapour (a retrofit kit or new fixture will be required) - roughly 40% savings • Has best CRI	• Least energy efficient of high pressure and low pressure sodium • Most efficient of white light lamps • 90 CRI for ceramic lights and 65-80 CRI for most types
Compact fluorescent	• Typically has a "figure eight" appearance • Similar lighting to incandescent	• Most incandescent applications (screw in bottom or pins for specially designed fixtures)	• Produce less heat than incandescent • 1/4 to 1/3 the energy requirements that an incandescent requires • 15 W can replace incandescent up to 60 W, 23 W up to 90 W; for incandescent over 90 W, try 28 W compact • 42 W offers a light output equivalent to an 80 W mercury vapour	• Do not use with standard incandescent dimmer switch; use a compact fluorescent switch • No flicker or hum associated with them • May require two to three minutes to achieve full light output • Does not require a cool down period after power interruption

TABLE 10.1 (CONTINUED) **DIFFERENT TYPES OF LIGHT AND EFFICIENCIES**

LIGHT TYPE	APPEARANCE	APPLICATION	COMPARISON/ EFFICIENCY	COMMENTS
High efficiency incandescent			• Use a 67 W high efficiency incandescent in place of a 75 W (5% less light but uses 11% less electricity)	
Incandescent	• Standard light bulb	• Interior lighting		• Electricity heats up a wire filament – causing it to glow and give off heat • >90% of the energy produced is heat – not light (acts like an electric heater) • Inexpensive • Good CRI • Work well with dimmers
Mercury vapour	• Bluish light (good for night vision)		• A 100 W metal halide (HID) can replace a 175 W mercury vapour (a retrofit kit or new fixture will be required) • Roughly 40% savings	• Poor efficacy and CRI • Efficacy deteriorates significantly with age
Halogen	• Gives off a whiter light than incandescent	• Popular as spotlights or narrow floodlights • Light quite focused (when used in a light stand, light is concentrated on the ceiling)	• Last 2,250 to 3,500 hours longer than incandescent • Maintain light output over time without fading • Creates 4 times more heat than an average incandescent • 500 W reaches temperatures of 1,200°C • Uses 40% less electricity for the same amount of light as a standard incandescent	• Also called tungsten halogen or quartz • An incandescent bulb with gases from the halogen family sealed in a glass case • Excellent CRI • Fire potential when incorrect voltage used • Standard halogens are efficient; most people use a high wattage (wasteful) bulb

10.4 Homes and Buildings

R-2000 construction is the most energy efficient to help prevent shell heating loss in homes and buildings on the farmstead. Insulating buildings to recommended levels by using R20-R30 insulation for walls and R30-R40 for ceilings is helpful. Thermopane windows also help decrease energy loss in the home, as do tight fitting doors and windows sealed with caulking and weather stripping. Installing a continuous air-vapour barrier to keep outside air and moisture from entering a building will also be effective to reduce energy losses.

Energy can be lost through water heaters and furnaces, so regular maintenance is crucial. A dirty water heater can operate as low as 73 percent efficiency, whereas a clean one operates at 90 to 95 percent. Periodically drain your water heater to remove accumulated sediment from the tank.

Whenever possible, use electricity outside of peak demand times (6:30 to 9:00 a.m. and 5:00 to 9:00 p.m.). This decreases the load on the community's electricity system and decreases overall electricity costs.

10.5 Shelterbelts

Energy conservation is a growing public concern. Shelterbelts can provide a reduction in energy consumption because the rows of trees and shrubs around the perimeter of a farmstead provide additional protection for farmyards or livestock facilities from adverse weather conditions. Shelterbelts reduce wind speeds, resulting in lowered heating and maintenance costs. Therefore, planting new shelterbelts or improving existing ones can produce economic benefits for the farm.

According to Agriculture and Agri-Food Canada - Prairie Farm Rehabilitation Administration (AAFC-PFRA), research indicates a typical farmhouse can reduce its heating costs by up to 30 percent with a correctly constructed shelterbelt. The optimal design for a windbreak of this type depends on the farm location and the site.

Shelterbelts are most effective when planted across prevailing wind directions. For increased sheltering effects, plant shelterbelts closer together; for maximum wind erosion control, plant the rows less than 200 m (660 ft) apart.

Besides reducing energy losses, shelterbelts also provide other benefits on the farm:

- increase aesthetics and property value
- control snow drifting by trapping snow
- decrease evaporation and improve water absorption
- increase soil moisture
- reduce wind and water erosion
- provide dust, odour and noise barriers
- store carbon
- provide wildlife habitat and biodiversity

Shelterbelts provide additional protection from windy conditions, resulting in lower heat costs — *Courtesy of PFRA*

10.6 Alternative Energy Sources

Renewable energy resources are great alternatives to fossil fuels. Alternative technologies include wind, solar, geothermal and small hydro-based power sources. Today's renewable energy technologies involve biomass-based products such as wood, straw, grasses, manure, corn/wheat-based ethanol or biodiesel.

When considering alternative energies, you first want to reduce your energy consumption. It is easier to save a watt than it is to produce a watt. Alternative energies can benefit many farmsteads as the cost tends to be less expensive than conventional sources over the long term. They also produce fewer greenhouse gases, which benefits the environment. It is up to you to determine which technology best suits your farmstead. The key is to look for alternatives that are practical, reliable, cost-effective and environmentally sustainable.

10.7 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697

- First Steps to Energy Management: Save Time and Money Agdex 818-2
- Shelterbelts in Alberta
- Shelterbelt Varieties for Alberta
- Wind Power Uses and Potential Agdex 767-2

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Agriculture, Food and Rural Development - AgTech Centre

Publications: 403-329-1212

- AgTech Centre Innovator Series
- Energy Free Water Fountains Report 706
- Field Study of Electrically Heated and Energy Free Automated Livestock Water Fountains
- Focus On Alternative Energy series
- Focus On Alternative Fuels series

Canada Plan Service

Publications: 780-422-4844

- 9700 – Fan Ventilation Principles and Rates
- 9702 – Troubleshooting Livestock and Poultry Ventilation Problems
- 9705 – Selecting Fans for Livestock Buildings
- 9710 – Fresh Air Inlets
- 9750 – Ventilation and Heating Small Livestock Rooms

Website: www.cps.gov.on.ca

Agriculture and Agri-Food Canada - Prairie Farm Rehabilitation Administration

Publications: contact your regional office

- Basic Shelterbelt Establishment Guidelines for Prairie Livestock Facilities
- Energy Savings and Farmyard Shelterbelts
- Livestock-Powered Water Pumps
- Planning Farm Shelterbelts
- Planting and Care of Shelterbelts
- Shelterbelts Help Cut Heating Costs
- Solar-Powered Water Pumping Systems for Livestock Watering
- Spacing Recommendations for Farmstead Shelterbelts
- Wind-Powered Water Pumping System for Livestock Watering

Website: www.agr.gc.ca/pfra

Natural Resources Canada

Publications: 1-800-387-2000

- Heating your Building with Solar Energy
- Photovoltaic Systems – A Buyer's Guide
- An Introduction to Stand Alone Wind Energy Systems
- Stand Alone Wind Energy Systems – A Buyer's Guide

Website: www.nrcan.gc.ca

Natural Resources Canada - Office of Energy Efficiency

Publications: 1-800-387-2000

- Infosearch 2001: Energy Efficiency at Your Fingertips
- There are several other publications available to help you become more energy efficient in these topic areas:
  - Appliances
  - Energy Efficient Products
  - Heating and Cooling
  - Home Building (R2000)

Website: www.oee.nrcan.gc.ca

Prairie Swine Centre Inc.

Office: 306-373-9922

- Energy Efficiency in Barns: Part 1
- Energy Efficiency in Barns: Part 2

Website: www.prairieswine.usask.ca

CHAPTER 11.0

Nuisance

This chapter discusses beneficial management practices that address nuisance concerns, such as dust, odour and noise, on the farm.

As agriculture and other land uses continue to compete for space in Alberta, nuisance conflicts will increase. Significant nuisances associated with farming operations include dust, smoke, odour and noise. Rural residents should consider how to best deal with and minimize these nuisances.

11.1 Dust and Smoke

Dust and smoke can be a concern for both rural residents and agricultural producers. Dust from traffic activities, whether from farming operations or road travel, and smoke from burning farm wastes can potentially create a nuisance for your neighbours. Practices to minimize or eliminate these nuisances will help lessen the conflicts that can occur. For more information regarding proper burning of debris, refer to section 8.1 of Chapter 8.

The following BMPs can be used to minimize or eliminate dust as a nuisance:

- Reduce speed when driving near farmsteads or country residential homes and use the least travelled route during times of heavy traffic volumes.
- Inform neighbours when and for how long farm-related traffic volumes are going to increase during busy periods.
- Be aware of the effect heavy traffic may have on your neighbours and if possible adjust your road travel accordingly. This practice may mean a reduction in farm-related traffic in morning, at night and on weekends.
- Wet down gravel or dirt roads with water or oil during times of heavy traffic. (For more information on applying oil to your roadways in accordance with regulations refer to Chapter 8.)
- Pave roadways in front of yard if possible.
- Use shelterbelts or windbreaks to reduce dust movement.
- Clean or remove excess manure from corrals as dry weather approaches.
- Reduce or eliminate tillage in nearby fields to prevent dust from wind erosion.

Wetting down dirt or gravel roads helps control dust around the farmstead — *Courtesy of PFRA*

The following BMPs can be used to minimize or eliminate smoke as a nuisance:

- Consider alternative disposal methods for green material and other wastes that may produce lots of smoke.
- Notify the fire department of your activities and have fire fighting and safety equipment available on-site.
- Be aware of the effect smoke may have on your neighbours; consider not burning at all or if possible adjust your burning schedule accordingly. This practice may mean not burning in morning, at night and on weekends.
- Inform neighbours when and for how long smoke-producing activities are going to occur.
- Only burn when weather and wind conditions allow more air movement to disperse the smoke.
- Ensure smoke does not drift on to roadways or into neighbours' yards by using proper containment units and providing smoke barriers.
- Ensure the fire is supervised and contained by providing a fuel-free buffer area.

11.2 Odour

Odours from farming practices, such as livestock production and manure storage and handling, can be major nuisances for nearby residences. Although it is very difficult to quantify the effects odours have on people, it is very important to be aware of the nuisance as it can potentially create conflicts among neighbours.

The following BMPs related to livestock production and manure storage and handling could be used to minimize or prevent odour as a nuisance and to resolve conflicts:

- Locate manure or compost storages a minimum distance of 150 m (492 ft) from neighbouring residences.
- Compost solid manure to reduce or eliminate odour during spreading.
- Select fields to avoid odour movement by wind into nearby neighbours' yards or spread manure when the wind is blowing away from your neighbours.
- Use lagoon covers or natural crusts to reduce odour losses during the warm season.
- Notify neighbours of when and for how long odour-producing activities will occur.
- Time manure lagoon agitation just prior to spreading to minimize duration of odour contact time with neighbours.
- Alter spreading times to avoid spreading on weekends, evenings and holidays to minimize odour contact with neighbours.
- Spread manure during midday when odour dispersion is best, and avoid spreading on hot, humid days when there is little air movement.
- Avoid applying high rates of manure and apply below the plant canopy when possible.
- Incorporate manure as quickly as possible after spreading or use injection systems.
- Reduce spreader deflection angle on liquid broadcasters to reduce drift (apply as close to ground as possible).
- Irrigate (where applicable) following application.

Other BMPs to avoid odour nuisances and conflicts associated with other practices on the farm include:

- Ensure the location of silage, mortality composting or other odour-producing practices are at adequate distances from neighbours.
- Design compost facilities correctly to ensure proper composting of material in a timely manner.
- Dispose of farm waste at proper waste management facilities.
- Use shelterbelts to manage odour movement by wind to neighbours.
- Tell neighbours or utilize signs in advance when odour-producing activities are planned.
- Time odour-producing activities to minimize contact time with neighbours.

11.3 Noise

Another nuisance associated with farming operations is noise. Many rural areas now have more non-agricultural landowners than before, and noise foreign to them from agricultural practices may become a nuisance. These noise concerns often relate to the volume, duration and/or timing of farming operations.

The following BMPs could be used to minimize or prevent noise as a nuisance and resolve conflicts:

- Advise neighbours in advance when noisy activities, such as calving or weaning occurs, and when planning to conduct loud operations, such as harvesting and grain drying.
- Time noisy activities, such as moving cattle or operating loud equipment, during the week and midday as opposed to weekends and evenings.
- Confine activities to areas remote from neighbours if possible.
- Use shelterbelts and windbreaks as noise barriers.
- Reduce engine noise by **gearing up and throttling down**.
- Prevent noise problems before they develop such as maintaining and repairing field equipment, machinery and vehicles.
- Avoid prolonged periods of idling equipment and vehicles near neighbours.
- Replace loud equipment with more efficient and quieter equipment.
- Locate loud building equipment, such as grain dryer or ventilation fans, on the opposite side of buildings away from neighbours.

Shelterbelts can help reduce dust, smoke, odour and noise concerns — *Courtesy of AAFRD*

11.4 Preventing, Managing and Resolving Conflict

Conflict is a struggle between two or more people because of a real or perceived difference in needs or values.

Properly managed conflict can be productive because it can:

- encourage people to examine issues more carefully
- deepen our understanding of problems
- open the door to new ideas and alternative solutions
- help foresee the consequences of proposed actions
- enable people to take risks and solve problems

Learning the skills necessary to prevent, manage and resolve conflict is important in today's society. The most important thing producers can do to reduce the risk of conflict associated with nuisances is to ensure communication with neighbours is open, honest and thorough.

To communicate with your neighbour effectively:

- take the matter seriously, listen to and acknowledge concerns
- be diplomatic and ask questions to identify the real issues
- apologize, admit mistakes, and when others make mistakes, help them save face
- shift the emphasis to mutually acceptable solutions and offer to look into the matter
- promptly respond to complainants with information they need to relieve their concerns
- take responsibility and steps to mitigate damage or eliminate problems
- stay on top of on-going problems, while keeping neighbours informed of on-going progress on the farm

Host a tour for your neighbours to help them understand your operation — *Courtesy of AAFRD*

Be a Good Neighbour

Being a good neighbour helps to build trust and understanding when problems arise.

Practices to strengthen your relationship with your neighbours include:

- getting to know them and letting them get to know you and your farming operation
- being friendly and helpful to neighbours in need
- getting involved in the community by supporting local charities and community groups, such as sports teams and youth groups
- supporting local businesses and hiring local youths
- hosting a farm tour, picnic/barbecue or potluck to generate goodwill and provide an opportunity for neighbours to ask questions about your operation in a relaxed atmosphere

11.5 Role of the Farmers' Advocate

The Alberta Farmers' Advocate Office (FAO) receives nuisance complaints about non-regulatory concerns like odour, noise, dust, smoke or other disturbances resulting from agricultural operations. Once a complaint is received, the FAO staff will assess the situation and determine if the complaint is valid. If it is valid, then the Farmer's Advocate will take a proactive approach in mediating between the disputing parties by providing information, support and possible resolutions to address the issues of concern.

When a complaint concerns an agricultural operation that is meeting the regulations, the Farmers' Advocate will provide the operator and complainant with possible solutions and systems to resolve their disagreement outside of the courts. The resolution process can help identify practical ways the farmer can address neighbours' concerns. The process can also help complainants better understand what is involved in acceptable agricultural practices; this perspective can be especially important for people who are new to living in rural areas.

11.6 Legislation

Producers should be aware of the following pieces of legislation that pertain to nuisance issues. For more information on legislation, refer to Chapter 12 of this manual.

Provincial Legislation

Agricultural Operation Practices Act

Environmental Protection and Enhancement Act
Substance Release Regulation

11.7 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697

- Agricultural Operation Practices Act (AOPA) – 2004 Reference Guide Agdex 096-1
- Beneficial Management Practices: Environmental Manual for Alberta Cow/Calf Producers Manual 2004 Agdex 420/28-2
- Beneficial Management Practices: Environmental Manual for Crop Producers in Alberta 2004 Agdex 100/25-1
- Beneficial Management Practices: Environmental Manual for Dairy Producers in Alberta 2003 Agdex 410/28-1
- Beneficial Management Practices: Environmental Manual for Feedlot Producers in Alberta 2002 Agdex 440/28-1
- Beneficial Management Practices: Environmental Manual for Hog Producers in Alberta 2002 Agdex 420/28-1
- Beneficial Management Practices: Environmental Manual for Poultry Producers in Alberta 2003 Agdex 450/28-1
- Manure and Pasture Management for Horse Owners Agdex 460/27-1
- Meeting Odour Head On Fact Sheets

Ag-Info: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Farmers' Advocate Office:

Office: 780-427-2433
Website: www.agric.gov.ab.ca/farmersadvocate

Sustainable Resource Development

Publications: 780-427-6807

- FireSmart: The Home Owners Manual No. I/189

Website: www.srd.gov.ab.ca

Canadian Farm Business Management Council

Phone: 1-800-232-3262

- Farming with Neighbours, A Guide for Canadian Farmers on Preventing and Resolving Community Conflicts over Farming Practices

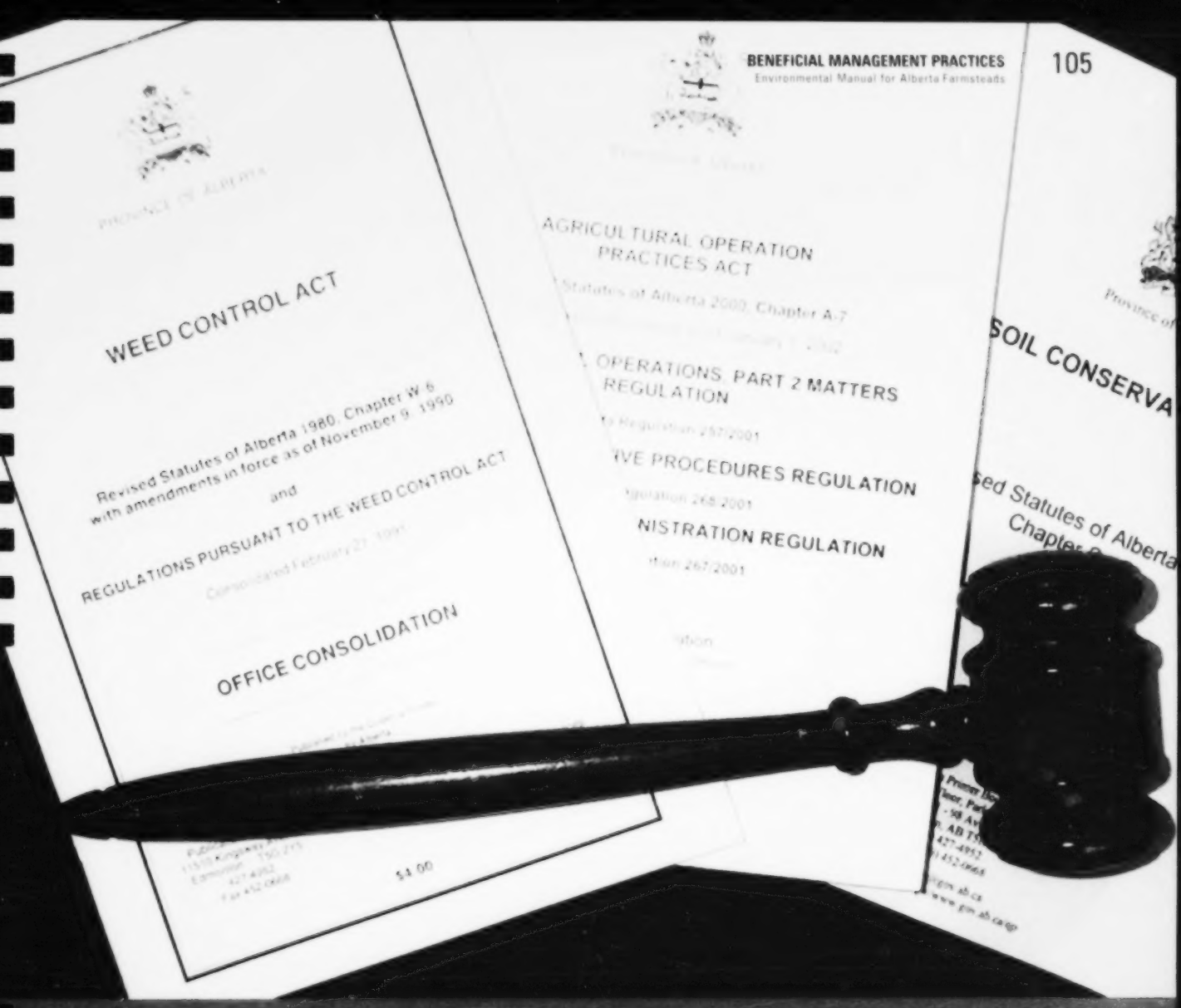
Website: www.cfbmc.com

Canada Plan Service

Publications: 780-422-4844

- 10704-Odour Control for Livestock Facilities

Website: www.cps.gov.on.ca



CHAPTER 12.0

Legislation

This chapter provides an overview of the legislation that pertains to environmental risks on a farmstead.

A number of provincial and federal government acts relate to potential environmental effects of agricultural practices and provide a foundation to ensure that agriculture is operating in a sound and responsible manner.

Your operation must meet the legal requirements described in the acts and regulations. This manual is aimed at producers who are striving for excellence in farmstead **stewardship**. Therefore, many of the practices described in the previous chapters go beyond the basic legal requirements to help you reach your goals for an environmentally and economically successful operation.

LEGAL REQUIREMENTS

The information in this chapter is provided for general information only. It is not intended as legal advice. Refer to the acts and regulations, and consult a lawyer for legal advice on specific legal rights and requirements.

More information on the environmental requirements under these acts can be obtained from government departments and agencies, consultants and lawyers.

Copies of Alberta's acts and regulations are available online or in hard copy from the Queen's Printer. For contact information, please refer to For More Information at the end of this chapter.

12.1 Federal Legislation

12.1.1 Fisheries Act

Deleterious Substance

The *Fisheries Act* is administered by the Department of Fisheries and Oceans and prohibits anyone from depositing or permitting the deposit of anything into any type of water frequented by fish, which can have a "deleterious" or harmful effect on the fish. Further, the Act prohibits anybody from depositing a "deleterious" or harmful substance in any place under any condition where the substance may enter any water frequented by fish. It defines the phrase "water frequented by fish" very broadly to include all internal waters of Canada. This definition includes any creek, river, stream, lake or slough frequented by fish, including a creek that has minnows in the spring, but dries up later in the summer.

For example, an operator commits an offence under the Act if he or she spreads manure on land near a stream frequented by fish, and the manure enters the stream in sufficient quantities to have a "deleterious effect." The offence results even if the manure does not actually cause harm to the fish. The mere fact that the manure reached water frequented by fish is an offence and may result in charges under this Act. In addition, even if the manure does not in fact enter the water, but had a reasonable chance of doing so, then the operator risks committing an offence. However, if the operator can prove that at all times, the water is not, has not been and is not likely to be frequented by fish, then the operator has not committed an offence under the Act.

Harmful Alteration, Disruption or Destruction of Fish Habitat

The *Fisheries Act* prohibits the carrying on of any work or undertaking that results in "harmful alteration, disruption or destruction" of fish habitat, although an authorization can be obtained from the Department of Fisheries and Oceans allowing such an activity. As noted above, fish habitat is defined quite broadly in the Act. These provisions may come into play in situations in which an operator would also require approval under Alberta's *Water Act* for a water management project.

Fish habitat is protected by the *Fisheries Act* — *Courtesy of AAFRD*

Liability of Directors and Officers

If a corporation violates the Act, any officer, director or agent of the corporation who was involved with the incident, even in a minor way, is liable on conviction to punishment under the Act, whether or not the corporation itself has been charged. This situation is true regardless of whether the officer, director or agent works for a large corporation or a small incorporated family farm. Thus an officer, director, agent or an incorporated farm can by held personally responsible for violations of the Act if the officer or director directed or participated in the violation.

Strict Liability Offences

Offences under the *Fisheries Act* regarding the deposit of deleterious substances or harmful substances into water frequented by fish are strict liability offences. The courts are only concerned with whether the operator committed the offence, not whether he or she intended to commit the offence or the morality of the actions.

If the operator did commit the "deleterious substance" action, the courts will convict the operator unless the operator can show that:

- at all times, the water is not, has not been and is not likely to be frequented by fish
- the operator acted with due diligence to prevent the commission of the activity at issue
- the operator reasonably and honestly believed in the existence of the facts that, if true, the operator's conduct would be rendered innocent

Fines

An individual or incorporated farm is liable to a fine not exceeding $1,000,000 for the operator's first deleterious substance offence and to a fine not exceeding $1,000,000 or to imprisonment for a term of not exceeding three years or to both for any subsequent deleterious substance offence.

12.1.2 Pest Control Products Act

The *Pest Control Products Act* specifies the responsibilities of the Pest Management Regulatory Agency (PMRA) of Health Canada for registration of pesticides for use in Canada.

In terms of user responsibility, as stated on the product label, anyone using a pest control product has the responsibility to read the label and follow the directions including the following:

- before purchasing a pesticide, to determine if the product will control the pest problem and if it can be applied in a safe manner
- before mixing the pesticide with other products or additives, to ensure product compatibility
- before spraying, to determine the required precautions during spraying, and to follow those precautions

12.1.3 Transportation of Dangerous Goods Act

Transportation of Dangerous Goods Regulations

The Dangerous Goods and Rail Safety Branch of Alberta Transportation administers the federal *Transportation of Dangerous Goods (TDG) Act* for the province.

The legislation identifies nine classifications of dangerous goods:

Class 1 – Explosives (e.g. ammunition, fireworks)

Class 2 – Gases (e.g. acetylene, anhydrous ammonia, propane)

Class 3 – Flammable and combustible liquids (e.g. diesel fuel, gasoline)

Class 4 – Flammable solids (e.g. calcium, sodium)

Class 5 – Oxidizing substances and organic peroxides (e.g. adhesives, disinfectants, nitrates)

Class 6 – Poisonous (toxic) and infectious substances (e.g. pesticides, vaccines, wood preservatives)

Class 7 – Nuclear substances (radioactive materials) (e.g. nuclear moisture gauges)

Class 8 – Corrosives (e.g. acids, bleach)

Class 9 – Miscellaneous products, substances or organisms (e.g. asbestos, hazardous wastes)

If a product such as a fertilizer, pesticide or fuel falls under one of these classes, then the TDG Regulations must be followed. The Act specifies that when shipping dangerous goods, proper classification, documentation and labelling are required. Placards must have safety marks designed specifically for each dangerous good and must consist of the class, shipping name and UN number. Before you handle, offer for transport or transport dangerous goods, you must have a valid Dangerous Goods Training Certificate or must be under the supervision of an individual who has undergone training.

There are exemptions to the TDG Regulations applicable to the agricultural industry in terms of training between two properties, personal use and limited quantities. For more information, refer to Alberta Transportation's Dangerous Goods and the Agricultural Industry publication.

12.2 Provincial Legislation

12.2.1 Water Act

The *Water Act*, administered by Alberta Environment, applies to all water on or underground, whether in liquid or solid state. The purpose of this Act, which became law in January 1999, is to support and promote the conservation and management of water, including its wise allocation and use.

Approval from Alberta Environment is required for the undertaking of an activity that may:

- alter the flow or level of water
- change the location or direction of water flow
- cause siltation of water
- cause erosion of any bed or shore of a water body
- cause an effect on the aquatic environment

The *Water Act* requires you to obtain a license for new wells that are drilled for any purpose other than household use. This Act protects the licensee from other water users who may be competing for the same water. If a new water user (other than a household) has a negative effect on the farmstead's water supply, the farmstead will have priority for the licensed amount. When issuing a license, Alberta Environment will ensure that the water use will not negatively affect other licensed users, household users or the watershed itself.

Any new well must be constructed to Alberta Environment standards. The well may only tap into one aquifer and must have the casing sealed from the top of the aquifer to the surface. To obtain a license, contact Alberta Environment. Part of the licensing process requires proof that water supplies are adequate for the farmstead's needs. New water use must not have a negative effect on neighbouring household wells or wells that have a senior water license.

For assistance with the initial assessment of groundwater potential, contact government agencies, such as Alberta Agriculture, Food and Rural Development (AAFRD) or Agriculture and Agri-Food Canada - Prairie Farm Rehabilitation Administration (AAFC-PFRA), which have access to maps and water well data. Local water well drillers can also provide valuable information. Alberta Environment has a sliding scale of requirements for licensing, depending on the amount of water uses. For more information, refer to the Groundwater Evaluation Guidelines at http:/www3.gov.ab.ca/env/water/Legislation/Guidelines/GroundwaterEvaluation.pdf.

12.2.2 Environmental Protection and Enhancement Act

The purpose of the *Environmental Protection and Enhancement Act* (EPEA), governed by Alberta Environment, is to support and promote the protection, enhancement and wise use of the environment.

The environment includes:

- air, land and water
- all layers of the atmosphere
- all organic and inorganic matter
- all living organisms
- the interacting natural systems that include each of the above components

Prohibited Releases

The *Environmental Protection and Enhancement Act* (EPEA) prohibits operators from releasing into the environment a substance in an amount, concentration or level or at a rate of release that causes or may cause a significant adverse effect on the environment. While "significant" is not defined in EPEA, "adverse effect" is broadly defined to mean the "impairment of, or damage to, the environment, human health or safety or property." For example, if a farm operator spreads manure on land at a rate that will overload the nutrient levels in the soil, or releases manure on land where the manure will run into a water body, the operator is in violation of EPEA.

Help protect the environment by adopting BMPs — *Courtesy of Duane McCartney*

Alberta Environment can issue a substance release Environmental Protection Order (EPO) when a substance release into the environment is causing, has caused or may cause an adverse effect. These EPOs can be issued even if an operation is in compliance with legislation, as they are intended to be remedial/preventive in nature rather than punitive. Generally, these EPOs will direct an operator to develop a plan for dealing with the release and to implement the plan once it has been approved by Alberta Environment.

Alberta Environment can also issue an EPO to an individual responsible for the release of an offensive odour, ordering an individual to, among other things, prevent, minimize or remedy the offensive odour or destroy the cause of the odour. This power does not apply to offensive odours from an agricultural operation that is carried on in accordance with "generally accepted practices" for that operation. However, there is no definition of "generally accepted practices." Whether an operator is following "generally accepted practices" will be decided by the Environmental Appeal Board or by a peer review board appointed by the Minister of Agriculture, Food and Rural Development.

Within these regulations, there are also provisions for impairing visibility on a highway or developed property due to emissions from activities such as burning debris.

Duty to Report

The EPEA requires operators to report any releases that may cause an adverse effect to the environment. A release must be reported immediately once it has been discovered. Failure to report a release can result in significant fines. Calling Alberta Environment's emergency response line (1-800-222-6514) is usually sufficient to report a release. In some circumstances, an operator will also be required to file a subsequent written report.

Typically, when an operator reports a release, Alberta Environment will require the operator to identify the steps to prevent harm to the environment and to prevent the release from reoccurring.

Liability of Directors and Officers

If a corporation violates the EPEA, any officer, director or agent of the corporation who was involved with the incident, even in a minor way, could face prosecution. This situation applies whether or not the corporation itself is prosecuted for the violation and regardless of whether the officer, director or agent works for a large corporation or simply a small incorporated family farm. Thus an officer, director or agent of an incorporated farm is held personally responsible for EPEA violations, if the officer, director or agent directed or participated in the violation in any way.

Intent to Commit

The vast majority of offences under the EPEA are "strict liability" offences. Unlike criminal offences, with strict liability offences, the courts are only concerned with whether the operator committed the offence and not whether he or she intended to commit the offence or the morality of the operator's actions. If the operator did cause the impairment, the courts will convict the operator unless the operator can show that the action was in accordance with due diligence in running the operation and in carrying out the activity at issue (see Section 9.3 for more on due diligence). That is, if the operator can show that all reasonable steps were taken to prevent the contravention of the EPEA, the operator may not be found guilty.

For a small proportion of the offences under the EPEA, the intent to commit the offence must also be proven to obtain a conviction. For those offences, the due diligence defence does not apply.

Fines

For strict liability offences, an individual is liable for a fine of not more than $50,000 for each offence under the EPEA, and a corporation is liable for a fine of not more than $500,000 for each offence. Each day that a release or impairment occurs is treated as a separate offence. For example, a release from a catch basin occurring over two days would be treated as two offences and expose the corporation to a maximum fine of $1,000,000.

Those offences that require proof of intent to commit the offence carry higher penalties: a $100,000 maximum fine for individuals and a $1,000,000 maximum fine for corporations.

Pesticide Sales, Handling, Use and Application Regulation

The EPEA regulates the sale, use, application, handling, storage, transport and disposal of pesticides.

For example, the regulations of this Act specify:

- use of pesticides according to the directions specified on the label
- transportation and disposal of pesticides in a way that ensures they will not contaminate food or water
- storage of pesticides in their original containers or in other containers that are clearly marked
- responsibility of the user for cleanup and decontamination in case of accidental spills
- washing of pesticide-contaminated material or sprayers is prohibited within 30 m (98 ft) of an open water body or on a public waterworks system
- pesticide storage is not allowed within 30 m (98 ft) of an open water body
- no person shall use, apply, handle, transport, store or dispose of a pesticide or operate any equipment involving the use, handling, transportation, storage, handling or disposal of pesticides in a manner that is or is likely to cause an adverse effect

The Act also specifies restrictions on the handling of pesticide application equipment:

- The operator must be present at all times while filling the sprayer and must maintain an air gap, or have an operating backflow prevention device while filling the sprayer tank from a municipal waterworks system or from an open body of water.
- A Pesticide Applicator Certificate and Service Registration are required for commercial applicators.
- A Special Use Approval permit is required from Alberta Environment to apply or store pesticides or wash equipment used to apply pesticides in, on or within 30 m (98 ft) of an open body of water. This condition does not include sloughs or ponds less than 10 acres in area, provided they are completely surrounded by private land with no drainage off the land.
- Some pesticides have unique hazard characteristics and require the applicator to be knowledgeable to use them. Therefore, producers must become certified to purchase and apply certain hazardous pesticides. This mandatory certification currently applies to: aluminium phosphide (Phostoxin, Gastoxin), picloram (Tordon 22 K) and triclopyr (Garlon).

Waste Control Regulation

The *Environmental Protection and Enhancement Act* (EPEA) deals with the management and control of waste in various provisions, and provides Alberta Environment with the ability to address hazardous waste matters through regulations. Hazardous recyclables are dealt with through the use of provisions related to the recycling of material as designated by regulation, and the control of waste (formerly litter) is dealt with in regulations as well as through the Act.

The *Waste Control Regulation* identifies hazardous wastes and sets out the requirements relating to handling, storing and disposing of such wastes. It also controls the treatment, storage and recycling of hazardous recyclables as well as defines anti-litter orders (such as controlling waste on publicly-owned land) and environmental protection orders (such as clean-up of unsightly property).

12.2.3 Livestock Diseases Act

Destruction and Disposal of Dead Animals Regulation

Alberta's *Livestock Diseases Act* governed by Alberta Agriculture, Food and Rural Development (AAFRD) deals with the proper handling of dead animals. For more details on guidelines for handling livestock mortalities, refer to Chapter 8.

12.2.4 Safety Codes Act

Private Sewage Disposal Systems Regulation

The *Private Sewage Disposal Systems Regulation* (AR 229/97) is governed under the *Safety Codes Act*. This regulation adopts the Alberta Private Sewage Disposal Systems Standard of Practice 1999, which is administered by Safety Services, Municipal Affairs.

The Alberta Private Sewage Systems Standard of Practice 1999 provides the minimum requirements for a new private sewage system. A handbook is available that provides explanations, information and drawings that will help you make decisions about your system. For more details on private sewage disposal system guidelines, refer to Chapter 9.

12.2.5 Agricultural Operation Practices Act

Standards and Administration Regulation

The *Standards and Administration Regulation*, governed under the *Agricultural Operation Practices Act* (AOPA), is administered by the Natural Resources Conservation Board (NRCB).

As of January 2002, new provincial standards for siting new and expanding confined feeding operations (CFOs) came into effect. Province-wide standards for manure management now apply to all livestock production in Alberta, including CFOs and cow/calf operations, as well as custom manure applicators and others who handle manure.

Surface-applied manure on conventionally cropped land must be incorporated into the soil within 48 hours — *Courtesy of AAFRD*

Key areas addressed by the *Agricultural Operation Practices Act* (AOPA):

Manure Application – all agricultural operations must follow the manure or compost application and minimum distance separations or setbacks to protect surface water and groundwater resources and reduce nuisance impact on neighbours.

Permits – a permit must be obtained prior to construction or expansion of a CFO or manure storage facility.

Existing CFOs – operations that existed on January 1, 2002 can continue to operate at their capacity. They are deemed to have a permit (approval, registration, or authorization) under AOPA whether or not they had a licence, permit, or other approval under the *Public Health Act* or a municipal development permit, or was constructed pursuant to a municipal development permit that was issued prior to January 1, 2002, or was issued as described in the *Agricultural Operation Practices Amendment Act* 2001.

Wintering sites – seasonal feeding and bedding sites where livestock are fed and sheltered do not require permits, but must be located 30 m (98 ft) or more from a common body of water.

Manure storage – the regulations specify proper siting and construction of solid and liquid manure storage facilities and collection areas.

Record keeping and Soil testing – CFOs, custom applicators, cow/calf producers and others who apply, transfer or receive more than 500 tonnes of manure or compost per year must keep records. They must also have a soil test that is no older than three years before applying manure on any field. They can apply manure as many times as necessary in the three years after the soil test, as long as the manure application will not result in exceeding nitrogen limits.

Nuisance – it is important that producers understand the common law of nuisance as it may affect them. The common law of nuisance is an individual's unreasonable interference with a neighbour's use and enjoyment of their land. If a producer participates in such activities that create offensive odours, excessive noise or dust, the courts may force him or her to pay damages to the neighbour as compensation for the nuisance and potentially force the producer to shut down.

To protect producers from nuisance claims, AOPA states that a producer will not be liable in court for any nuisance resulting from the producer's operation, nor will the producer be prevented from carrying on operations by a court injunction or order. This holds true only if the producer has not contravened the local land-use bylaws and has followed "generally accepted practices for similar agricultural operations."

The act defines a "nuisance" to include an activity which:

- arises from unreasonable, unwarranted or unlawful use by a person or the person's own property, which causes obstruction or injury to the right of another person or the public and produces such material annoyance, inconvenience and discomfort that damage will result
- creates smoke, odour, noise or vibration, which interferes with the reasonable and comfortable use of a person's property
- is found to be a nuisance at common law

For more information on the *Agricultural Operation Practices Act* (AOPA), contact Alberta Agriculture, Food and Rural Development (AAFRD) or the Natural Resources Conservation Board (NRCB).

12.2.6 Soil Conservation Act

The *Soil Conservation Act* gives municipal councils the authority to protect land from soil loss or deterioration. Under the Act, each landholder has the responsibility to actively prevent soil loss or deterioration from taking place or, if soil loss or deterioration is already taking place, to stop it from continuing. Each municipal council has the duty to ensure that each landholder in its jurisdiction fulfills this responsibility.

When agricultural practices cause or are likely to cause soil degradation, a soil conservation officer, usually an agricultural fieldman acting on behalf of the municipality's Agricultural Service Board, may serve notice on the landholder advising him or her to take remedial action within a specified time. The landholder may appeal this notice. If the appeal fails, then the landholder must comply with the notice.

If the remedial action is not done within the specified time, the soil conservation officer and/or others under the officer's direction may enter the property and perform the required work. The cost of this work may be collected by a tax on the property. Any person obstructing the officer or failing to comply with the notice is subject to a fine of up to $5,000.

Landholders are required to actively prevent soil degradation — *Courtesy of AAFRD*

12.2.7 Weed Control Act

The *Weed Control Act*, administered by the municipality, provides the legal authority to enforce weed control. It identifies three categories of weeds: restricted, noxious and nuisance. The Act mandates the eradication of restricted weeds and control of noxious and nuisance weeds.

12.2.8 Agricultural Pests Act

Pest and Nuisance Control Regulation

The *Pest and Nuisance Control Regulation* is governed under the *Agricultural Pests Act* and enables legal authorities to deal with native and introduced pests, which affect farming operations. Pests vary from Dutch elm disease to the Norway rat, while nuisances vary from coyotes to ground squirrels. The Act gives the municipal local authority the option to enforce control measures, provide a warning or do nothing about pest concerns.

12.3 For More Information

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Publications: 1-800-292-5697
Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Environment

Publications: 780-427-2700
Emergency Response Line: 1-800-222-6514
Website: www.environment.gov.ab.ca

Alberta Municipal Affairs

Phone: 780-427-2732
Safety Services: 1-866-421-6929
Website: www.municipalaffairs.gov.ab.ca

Natural Resources Conservation Board

Contact your regional office
24 hour response line: 1-866-383-6722
Website: www.nrcb.gov.ab.ca

Queen's Printer

Phone: 780-427-4952
Website: www.qp.gov.ab.ca

Department of Fisheries and Oceans

Prairies Region: 780-495-4220
Website: www.dfo-mpo.gc.ca

Environment Canada

Prairie and Northern Region: 780-951-8600
Website: www.ec.gc.ca

Pest Management Regulatory Agency

Pest Management Information Service: 1-800-267-6315
Website: www.pmra-arla.gc.ca

Environmental Law Centre

Publications: 1-800-661-4238 or 780-424-5099
Website: www.elc.ab.ca

Appendix

Emergency Planning, Clean-up and Handling Procedures

Every farmstead needs an emergency plan that outlines the location and identification of hazardous materials, emergency equipment, telephone numbers and necessary clean-up methods. Such a plan gives those living on the farmstead guidelines to follow for minimizing potential environmental damage to the site, as well as protecting those living on the site and in the surrounding community.

An emergency plan for your farmstead should be made accessible to others who visit or work on the farm. Emergency response teams should also have access to the plan to help them distinguish between response procedures for different situations.

In the case of spills with hazardous sources such as pesticides, fuel, fertilizer, or livestock manure, those living and working on the farmstead need to be responsible for minimizing environmental and safety risks by following these steps:

1. Isolating the affected area
2. Wearing protective clothing
3. Ventilating the area
4. Stopping further leaks
5. Containing the spill area
6. Reporting the spill
7. Cleaning the spill
8. Decontaminating the spill area
9. Disposing and reclaiming the waste

To ensure human health and safety, protect the environment and prevent a more extensive problem, report all spills (immediately if entering or threatening a water body or source). Reporting a spill provides information if clean up is required. It also provides a record in case the incident is reported by someone else and leads to an investigation that may result in costly sample taking and associated chemical analyses to determine what has been spilled.

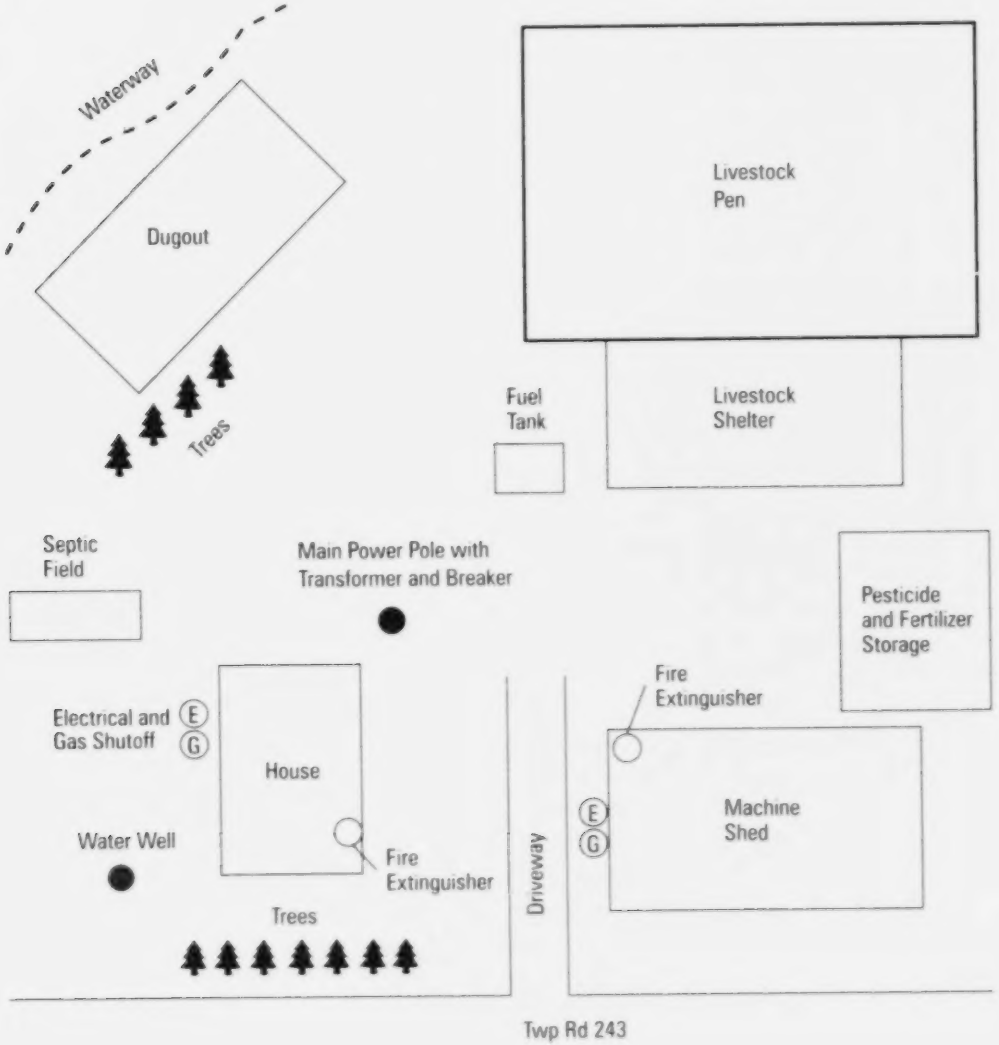
In the case of a non-hazardous, accidental spill, it is always a good idea to carry a supply of fresh water and a clean pair of gloves to wear when cleaning up. First, it is important to read any product labels or contact the manufacturer for advice on clean-up procedures (most products have a 1-800 customer service number on the label). Disposing of all absorbent materials must be done in an approved landfill. If the spill is large, evacuate the area and notify Alberta Environment through their Emergency Response Centre at 1-800-222-6514.

Mapping out your farmstead site may be a good first step to identifying potential hazardous areas (see Figure 1). The following diagram outlines where all buildings are located in proximity to roads, dugouts, fuel tanks, corrals or animal shelters. Main power poles with transformers and breakers should also be included. In addition, be sure to include anything that can become a hazard on the map:

- compressed gas storages (oxygen, acetylene and air tanks)
- fuels and oils
- electrical, gas and water shutoffs
- water well locations (including abandoned and unused wells) and water sources (including dugouts)

- fertilizer and pesticide storages, as well as mixing and loading areas
- compost and manure storage areas
- farm waste storage areas
- septic systems
- fire fighting equipment such as fire extinguishers

FIGURE 1 FARMSTEAD MAP OF POTENTIAL HAZARDS AND SOURCES



For More Information:

All Alberta government offices may be reached toll-free by dialing the Rite Line: 310-0000

Alberta Agriculture, Food and Rural Development

Alberta Farm Safety Program: 780-427-4231

- Handling Pesticides: Are You Protected?
- Safe Handling of Agrochemicals

Ag-Info Centre: 310-FARM (3276)
Website: www.agric.gov.ab.ca

Alberta Municipal Affairs

Fire Commissioner's Office: 780-427-8392
Field Technical Services: 1-866-421-6929

- Fire Safety Publications

Website: www.municipalaffairs.gov.ab.ca

Sustainable Resource Development

Publications: 780-427-2700

- FireSmart Manual: Protect Your Home From Wildfire, 3rd Edition SRD-025-IC

Forest Fire Line: 310-FIRE (3473)
Website: www.srd.gov.ab.ca

Alberta Environmental Farm Plan Company

Office: 1-866-844-2337

- Emergency Farm Plan Tube

Website: www.albertaefp.com

Glossary of Terms

Abandoned well

An unused well, left unattended and not maintained for future use.

Application rate

The recommended amount of fertilizer, manure or pesticide applied to a specific area; for example, 1 kg per hectare (0.9 lb per acre).

Aquifer

A geologic formation or stratum that yields significant quantities of water. Aquifers are the source of water for wells and springs.

Backflow

The unwanted, reverse flow of liquids into a piping system.

Beneficial Management Practice (BMPs)

Any agricultural management practice that mitigates or minimizes negative effects and risks to the environment by maintaining or improving water, land and air quality and biodiversity.

Bioconcentration

Accumulation of a substance in the tissue of an organism.

Biodiversity

Biological diversity: the variety of living organisms, **ecosystems** and ecological processes.

Biomagnification

A cumulative increase in the concentration and toxicity of a persistent substance in successively higher levels of the food chain.

Biosecurity

Any action or practice involving precautions to reduce the risk of introducing diseases to a farm site or region where they do not already exist.

Bollards

Barriers constructed of a sturdy material, such as steel piping filled with cement, set up close to facilities such as fuel tanks or buildings to guard against collision damage.

Buffer zone

An area of land adjacent to a water body or sensitive area such as a riparian area that is developed or conserved to reduce erosion, intercept pollutants and provide wildlife habitat. The buffer zone is undisturbed or left in permanent vegetation.

Closed handling system

A system for transferring fertilizers or other chemicals directly from the storage container to the applicator equipment, so humans and the environment are never exposed to the chemicals.

Constructed wetland

A man-made wetland system constructed to capture and treat agricultural wastewater including runoff that relies on physical, chemical and biological processes to treat the wastewater.

Contamination

The alteration of a material by the introduction of a chemical or other substance that makes the material unfit for a specified use.

Cross connection

A direct arrangement of piping that allows the potable water supply to be connected to a source that contains a contaminant. For example, a garden hose with the end submerged in a stock tank, laundry tub or sprayer tank or a pasture pipeline system with submerged float valves.

Cryptosporidium

A single-celled, microscopic parasite that lives in the intestines of humans and animals. The dormant form is excreted in the stool of infected animals and humans and presents health risks.

Ecological processes

The relations of organisms to one another and to their physical surroundings or continuous action or series of actions strongly influenced by one or more ecosystems.

Ecosystem

A system of living organisms interacting with each other and their environment, linked together by energy flows and material cycling.

Escherichia coli (E.coli)

E. coli are bacteria found in the intestines of humans and warm-blooded animals, and are necessary for a number of important functions, including digestion. However, different strains present a health risk, such as E. coli O157:H7, produce powerful toxins causing severe illnesses such as bloody diarrhea, fever, vomiting and kidney failure.

Gearing up and throttling down

A driving technique used to improve tractor fuel efficiency and reduce noise level. The driver reduces the engine speed and shifts up a gear to maintain the same ground speed.

Giardia

A single-celled, microscopic parasite that lives in the intestines of humans and animals. The dormant form is excreted in the stool of infected animals and humans, presenting health risks.

Greenhouse gases

Water vapour, carbon dioxide, ozone, methane, nitrous oxide and chlorofluorocarbons that contribute to the greenhouse effect trapping heat in the earth's atmosphere.

Greywater

The relatively clean wastewater that does not contain human or animal wastes, but wastes from water used in tubs, sinks or washing machines.

Groundwater

Water found below the ground surface. This water is free to move by gravity, soaking into the ground from wetlands, lakes or precipitation. The upper surface of the groundwater forms the water table.

Habitat

The environment in which a plant or animal lives.

Hazard

A source of contamination that has the potential to cause a negative effect.

Impermeable

Restricted movement of liquids, gases or odour through a given material.

Infiltration

The downward movement of water through cracks, joints and pores in soil and rock.

Leaching

The downward movement of water carrying dissolved or suspended substances through the soil profile.

Minimum Distance Separation (MDS)

The absolute minimum distance established as a setback or buffer to reduce nuisances and environmental risks between sources of contamination or hazards such as sewage or manure storage facilities and any receptors such as adjacent land, residences, water bodies or water sources.

Nuisance

Any activity that arises from unreasonable, unwarranted or unlawful use of a person's own property causing obstruction or injury to another person or the public. The activity creates smoke, odour, noise or vibration resulting in annoyance, inconvenience, discomfort and/or damage as well as interferes with the reasonable and comfortable use of a person's property.

Nutrient

An element essential for plant or animal growth. Major nutrients include nitrogen, phosphorus, carbon, oxygen, sulphur and potassium.

Organic Matter

Comprised primarily of plant residues at various stages of decomposition.

Pathway

A pathway describes how a hazard travels from a source to a receptor. Pathways can be water, air, soil, human, animal or any combination.

Pitless Adaptor

A mechanical device used to provide frost-free, sanitary well connections that are designed to replace pump houses and well pits.

Pressure rinse

A method to rinse pesticide containers properly. Water is sprayed under high pressure against all inside surfaces of the container, and the rinsate is added to the sprayed tank.

Receptor

A receptor is something that has the potential to be affected, usually in an adverse way, by a given hazard.

Rinsate

Wastewater from cleaning the inside of product containers or chemical application equipment.

Riparian area

Riparian areas are lands adjacent to surface water bodies where the soil and vegetation are strongly influenced by water. Riparian areas stay greener longer and produce more forage than uplands, partly due to soils and mostly due to an elevated water table.

Runoff

Water that moves across the land as overland flow or that moves laterally in an unsaturated zone as interflow or subsurface flow.

Run-on

Water that flows onto a given area.

Secondary containment

Any structure, such as a dike, built around a chemical storage area to hold 110 percent of its maximum volume.

Seepage

Seepage is the slow movement of water through the soil from a large undefined area into or out of a surface or subsurface water body. In contrast, a spring is where water emerges from a defined location.

Stewardship

Stewardship can be defined as an individual's responsibility to manage resources and to ensure resources are sustained or enhanced for future generations.

Surface water

All water found on the ground surface, such as lakes, ponds, sloughs, wetlands, dugouts, rivers, creeks, temporary streams, canals and drainage ditches.

Sustainable

Practices that provide a flow of goods and or services over a long period of time without degrading the environment or lowering productivity.

ULC and CSA approved

Tested and approved for safety by the Underwriters' Laboratories of Canada (ULC) and the Canadian Standards Association (CSA). Some items, such as chemical storage containers, must have ULC approval.

Vegetative filter strip

Vegetation planted along or around a sensitive area to slow down the movement of water to help settle out solids, and filter contaminants by providing oxygen to microbes that transform contaminants into less harmful forms.

Water body

Any location where water flows or is present. Water bodies include lakes, wetlands, aquifers, rivers and sloughs.

Water source

A developed or natural structure containing raw or potable water that is used for a specific purpose.

Water table

Upper level of the soil zone, where all spaces between the soil particles are filled with water and the soil is saturated.

Waterway

A low path where surface water collects and flows.

Well cap

A commercially manufactured device used to cover the top of a well casing. This cap prevents surface water, solid material or other substances from entering the well through the top of the well casing.

Well casing

Steel, plastic pipe or concrete tile installed as a lining when a well is constructed. A casing serves to strengthen the well bore hole, so it does not collapse. It also prevents contaminants from entering a well and allows placement of a pump or pumping equipment.

Well pit

Lined, shallow excavation constructed around the top of the well casing of a drilled well. It is no longer legal to construct a well pit in Alberta.

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